



THE WORLD BOOK

MODERN

ENCYCLOPEDIA

PICTORIAL

COMPREHENSIVE

In Twelve Volumes

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ELEVEN

SMYRNA, *smur' nah*, or **IZMIR**, since 1930, a vilayet and city of Turkey, situated on the western coast, on an arm of the Mediterranean Sea. The city lies about 200 miles southwest of Constantinople, with which it is connected by a line of railway, and is built partly on the slopes of Mount Pagus and partly on the plain below. This city, which is on the site of a Greek colony in existence over seven centuries before Christ, has long been famed as the center of an Oriental rug trade, and it long enjoyed comparative prosperity. However, the struggles and hostilities for the possession of Smyrna which followed the World War reduced both the prosperity and the population. Italy had been promised Smyrna in 1917 by a secret agreement which was never ratified. Venizelos, a Greek statesman who had been anxious from the beginning of the war to have Greece enter on the side of the Allies, had his eye on the Smyrna territory for Greece. He represented his country at the Peace Conference, and during the period when the Italian delegates had retired because of disagreements, he succeeded in having Smyrna awarded to Greece on terms of temporary occupation. As soon as the Greek troops landed, about May, 1919, atrocities began, from which Turkish inhabitants suffered most.

In August, 1920, the Treaty of Sèvres confirmed Greek occupation, and put the Smyrna area and the Ionian hinterland under Greek sovereignty for five years, at the end of which time Greece might incorporate the territory outright, or hold a plebiscite as a matter of formality. The boundaries, as set off by the treaty, were not identical with the autonomous Smyranean area which Venizelos had in mind, but, having been revised to suit Italy and France, the lines ignored natural frontiers, cut across railways, and showed utter disregard for geographic or economic unity. These conditions were responsible for the failure of the arrangement. The population was not predominantly Greek, as Venizelos had claimed, and among the merchants and industrialists were many other nationals, as well as Greeks.

For the first two years, Greece was successful in hostilities against the Turks, though its conduct caused it the loss of the good will of Great Britain. The London Conference of 1921 attempted to deal with the situation by

suggesting allied military interference, but the subject was dropped. By 1922, Greek success began to wane, and the Paris Conference proposed that the area be given to Turkey. Though an agreement was not reached at this time, it was the signal for many Greeks to leave Smyrna, while the Turks entered. In September, 1922, three days after the arrival of the Turks, a great fire broke out, which destroyed nearly three-fifths of the city, only the Turkish area escaping. Thousands of lives were lost, there was great property damage, and the city received a setback from which it will take many years to recover. Whether the Greeks or the Turks started the conflagration is not known, but it marked the climax of about four years of atrocities in which both sides were implicated, and which left Europe with perhaps less sympathy for the Greeks than for the Turks. The Lausanne Treaty of 1923 restored Smyrna to Turkey.

Mustafa Kemal, Turkish soldier, statesman, and first President of the Turkish republic, realized that lack of a knowledge of economics, as well as shiftlessness, dishonesty, and indolence, were defeating progress and development in Turkey. In 1923 he called an economic congress at Smyrna, and issued an *Economic Pact* setting forth Turkish sins and omissions and suggesting reforms. Efforts are being made to revive the carpet-weaving and textile industry in Smyrna. The carpet industry is operating at about sixty per cent of the pre-war capacity, and cotton ginneries are gradually being rebuilt; flour-milling is also on the increase. Smyrna has good railroad connections, and it remains the second port in Turkey.

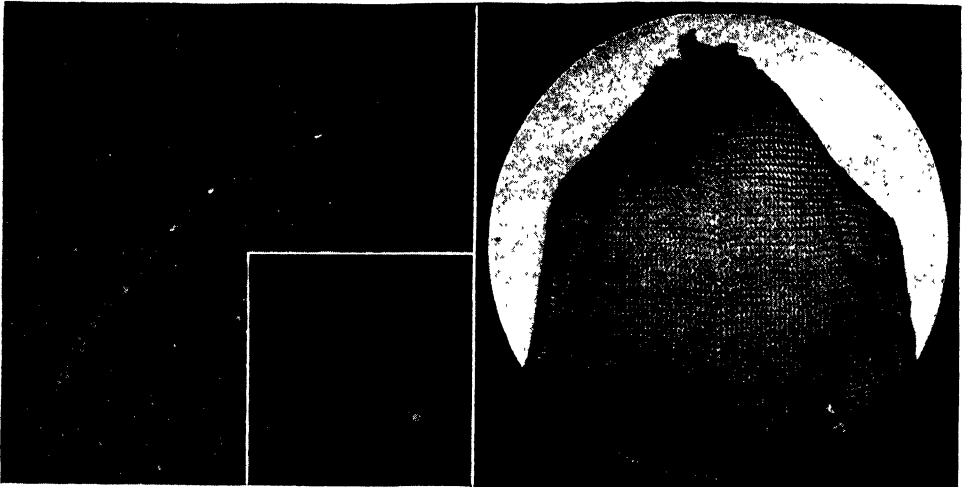
As in other Near East countries, airports and airplane communications are being established in the vilayet. Population, 1927, 153,845; of the vilayet, 531,579.

Related Subjects. The reader is referred in these volumes to the following articles:

Greece
Kemal, Mustapha
Lausanne, Treaty of

Sèvres, Treaty of
Turkey
Venizelos

SNAIL, *snayl*, a mollusk inhabiting both land and water, and distinguished by having a spirally coiled shell attached to the soft body (see **MOLLUSKS**). A snail, when it desires



Photos: St. Clair; Visual Education Service

INTERESTING INFORMATION ABOUT SNAILS

At left, a snail photographed on a concrete sidewalk, showing the slimy trail it leaves behind; a snail on a leaf. At right, the palate of a garden snail, as seen under a microscope.

protection or wishes to go into winter quarters, withdraws the entire body into the shell, as the attaching membrane is a muscular process. This shell, which consists of but one valve, is often called the "house of the snail." It is secreted by the skin of the animal, and is composed of a limy substance. At first the shell is soft and pliable, but it becomes harder as the animal grows to maturity. Charles Lamb once wrote:

The frugal snail, with forecast of repose,
Carries his house with him where'er he goes.

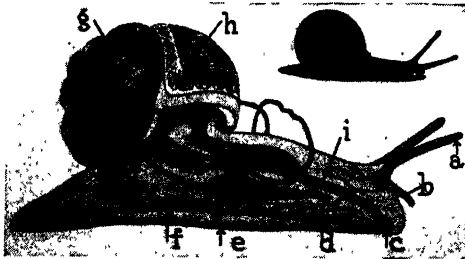
Snails move so deliberately that the expression "slow as a snail" has become proverbial. It has been estimated that one kind of snail could cover about half a mile in a week.

The typical land snails are found in warm, damp places in fields and woodlands; they especially like a situation under a fallen log or in a mossy tree stump. Their organ of locomotion is a so-called foot, a long, muscular pro-

jection extending from the shell. By contractions of this organ, the snail slowly crawls along, its progress being aided by the excretion of a slimy mucus. One of these creatures can be trailed by the slimy track it leaves behind it. On the forward end of the foot is a head bearing two pairs of tentacles, or horns, and on the upper pair of tentacles are the tiny, black eyes, capable of seeing in all directions. The lower pair of horns constitute the organs of touch. The mouth is provided with a peculiar, ribbonlike tongue, which is covered with numerous tiny, hard teeth. Though snails are fond of leaves and other vegetable matter, some are flesh-eaters.

Snails are used as food in many places in Southern Europe, and snail farms, or snaileries, are common in France, Spain, and Italy. In France, snail flesh is a standard delicacy of the menu; it is estimated that the people of Paris alone consume about 200,000,000 snails a season. Though snail culture began near Rome about 50 B.C., it was not introduced into France until the latter part of the eighteenth century. Now the snaileries not only supply the local demand, but have a surplus for export to the United States. In the snaileries, the animals are fed cabbage, lettuce, endive, dandelion leaves, potatoes, bran mash, fruit, and aromatic herbs. If a popular taste could be created for snail flesh, it might replace oyster flesh, which it resembles in flavor. Snails could be grown economically in the Mississippi Valley.

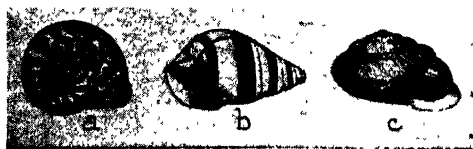
Water snails live in both fresh and salt water. Some of them breathe air through an opening on the back into the lung cavity; others breathe in the water by means of gills



PARTS OF A SNAIL

(a) Eye; (b) tentacle; (c) mouth; (d) nerve ganglia; (e) foot; (f) mucous gland; (g) liver; (h) lung; (i) oesophagus. The upper illustration shows the snail in its natural position.

which resemble those of the oyster. There are many varieties of water snails, and they are found in all parts of the world. Fresh-



LAND-SNAIL SHELLS

(a) Common Philippine variety; (b) colored shell from Florida; (c) the most common shell found in America.

water snails are more numerous in the temperate zones. S.H.S.

Classification. Snails belong to the class of mollusks known as *gastropods* (see GASTROPOD). The larger and most numerous snails are found in the family *Helicidae*. The species commonly eaten in Europe is *Helix pomatia*.

SNAKE. Living on and under the ground, in fresh and in salt water, and in trees, more than 1,500 species of snakes are found in nearly all parts of the world, with the exception of Polar regions and most oceanic islands. There are no snakes in New Zealand, the Hawaiian Islands, the Azores, or Ireland. In the tropics these reptiles are found in greater numbers than anywhere else, and here, too, they attain the largest size. The giant anacondas of South America grow to be thirty feet in length, but there are very small species not over five inches long, and all degrees of size in between. Snakes form the largest division of the reptiles, in which they are grouped with certain other cold-blooded vertebrates—the lizards, turtles, tortoises, alligators, and crocodiles.

Characteristics of Snakes. A snake, wherever found, may be recognized by the slender wormlike body that wriggles along by means of certain movements of the ribs. The snake has to get a "purchase" on the place over which it crawls, and cannot make any headway on a perfectly smooth surface. With the exception of a few species having primitive hind legs, snakes are wholly legless. The body is regularly cylindrical, and has no distinct divisions of head, trunk, and tail. Contrary to the belief of many, it is not slimy, but is covered with dry scales, which are folds in the skin. There are no external ears and no eyelids. The portion of the ear with which the snake detects sound is covered by skin and scales. In fact, some species, as the rattlesnakes, are practically deaf. The eyes are protected by a transparent cap that is shed with the skin. Like the Evil One, of which it is the symbol, the snake sleeps with its eyes open. The tongue is long, slender, and forked. It is the animal's best organ of touch, and is continually thrust out when it wishes to

ascertain its whereabouts. The teeth, which curve backward, are sharp and pointed, and are used in seizing food but not for chewing, as the prey is swallowed whole. Poisonous species have, in addition to the ordinary teeth, perforated fangs in the upper jaw, through which the poison fluid passes from glands at their base. Snakes can swallow creatures much larger than themselves, as the lower and upper jaws are hinged together in such a manner that the mouth can be widely extended. In addition, the halves of the lower jaw are connected in front by an elastic band, and each side can be pushed forward independently. As a rule, the prey is swallowed alive, but the huge pythons and boas first kill their victims by crushing them.

According to their modes of life, snakes may be divided into burrowing, ground, tree, freshwater, and sea snakes. The poisonous species are found on the ground, in trees, and in the sea. Animal life is the chief food of snakes, but a few species eat eggs. Some snakes lay eggs, and the young are hatched outside the mother; others bring forth their young alive.



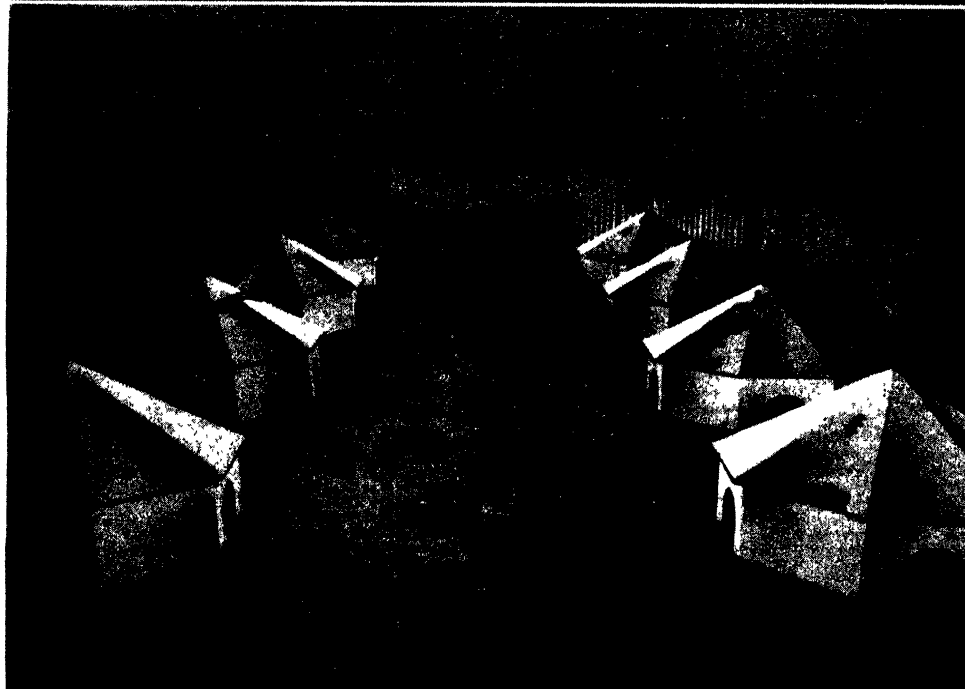
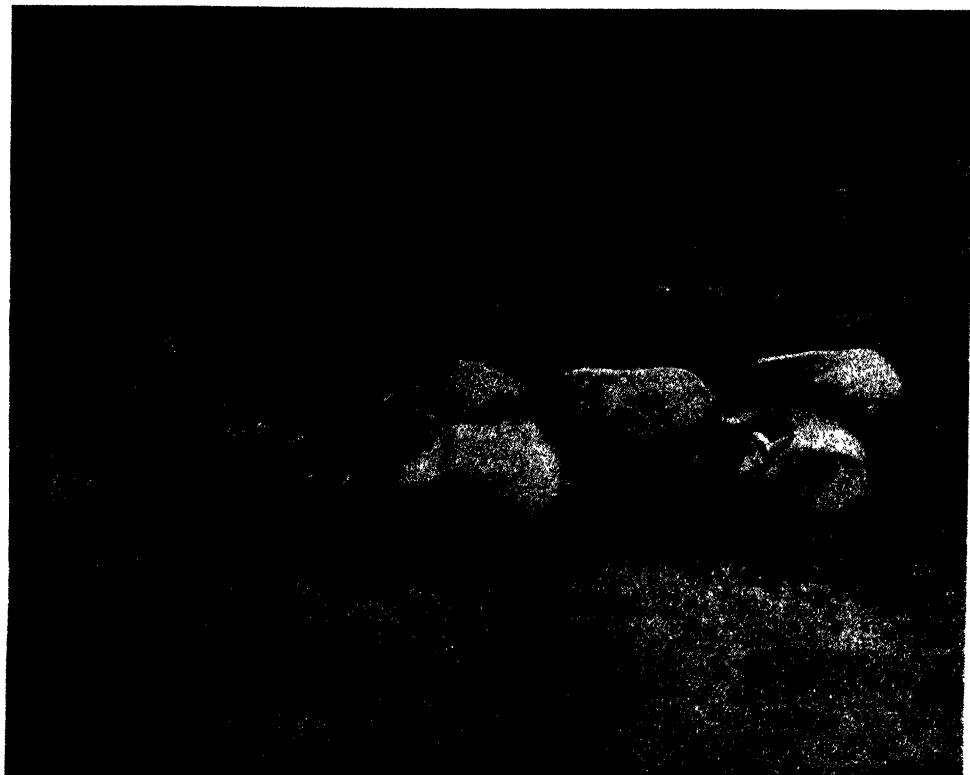
Photo: Visual Education Service

A MOLTED SNAKE SKIN

It is not unusual to find very perfect skins in rocky or bushy places, for the snake is in the habit of molting the skin several times a year (see MOLTING).

Economic Value of Snakes. Snakes are too often regarded with fear and repulsion, when they should be considered friends of mankind. With a few exceptions, snakes are harmless, and even the venomous species do not usually attack human beings deliberately. On the other hand, snakes kill large numbers of rats, mice, and other crop-destroying rodents, thereby rendering valuable service to the farmer. It has been estimated that one snake will eat, in six months, nearly 150 mice.

How to Tell Venomous Snakes. The poisonous snakes found in the United States belong to four groups—the coral snakes, the rattle-



Neither Lovely nor Attractive. Grass snakes hatching from eggs [photographed in the London (England) zoo]. Below, scene on a Honduras snake farm; here venomous reptiles are raised for the purpose of extracting their poison for use in serums to protect men against their bites.

Photo: U & U

snakes, the water moccasins, and the copperheads. The coral snakes, which are among the most poisonous, are found only in a small area in the South, and may be recognized by their markings of conspicuous reddish bands. The other three varieties belong to the subfamily of pit vipers, and may be known by the characteristic pit between eye and nostril. A venomous snake, too, has a body thick in proportion to its length, a triangular head which may be distinguished from the neck, and elliptical, catlike eye pupils, rather than round ones.

Snake Bite. Cases of poisonous snake bite will usually yield to the following remedies:

1. Place a tourniquet around the limb above the wound, to keep the venom from flooding the system. This should be relieved slightly at approximately one-hour intervals, in order that the blood in the injured member may be refreshed, and that the venom may very gradually be eliminated from the system.
2. Cut into the marks made by the fangs, with a razor or any other sharp instrument, as the resulting bleeding will help wash out the poison. Better, cut out the tissue for an

and put under the care of a physician who understands the treatment. L.H.

Scientific Names. Snakes belong to the class *Reptilia*, order *Squamata*, suborder *Ophidia*. Authorities differ considerably as to their grouping into families, but the most important of those generally recognized are the following: *Boidae*, including the boas, anacondas, and pythons; the *Colubridae*, comprising ninety per cent of the living species; and the *Viperidae*, including the subfamilies *Viperinae* (true vipers) and *Crotalinae* (pit vipers).

Related Subjects. The reader is referred to the articles listed below:

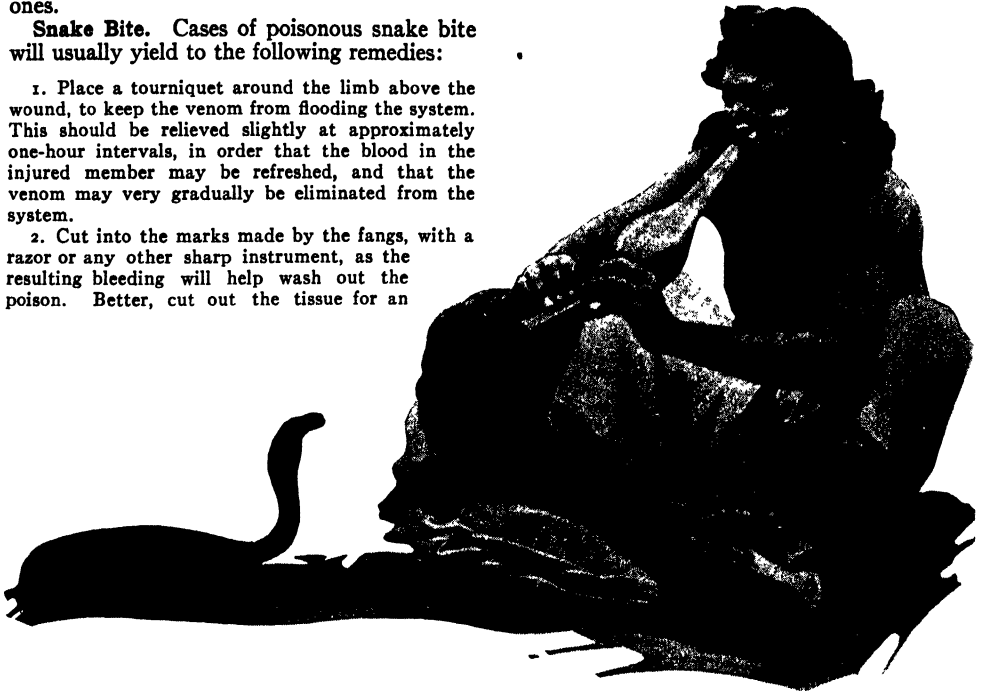


Photo: U & U

A SERPENT CHARMER OF INDIA

inch around the fang marks. If this is not practicable, sear the wound with a red-hot iron.

3. The wound may be sucked and the venom spat out, but such a procedure is dangerous if there is a scratch or sore on the lips or gums.

4. Rub into the wound some crystals of potassium permanganate, or, better, inject with a hypodermic syringe a solution of the permanganate with boiling water. Iodine applied in and about the wound and taken internally is recommended for rattlesnake bite.

5. In case of collapse, the patient may be stimulated with strong, hot coffee, or aromatic spirits of ammonia, half a teaspoonful being given half-hourly in cold water. Under no circumstances should whisky be given. It is not an antidote for snake bite, and is usually distinctly harmful to the patient.

6. Remember that many hospitals, and all museums which contain venomous snakes, have a supply of the snake serum at hand. This is the surest remedy for the venom of the snake; therefore, if possible, the patient should be taken immediately to a hospital

Adder
Anaconda
Asp
Blacksnake
Boa
Cobra
Copperhead
Garter Snake

Glass Snake
Milk Snake
Moccasin Snake
Python
Rattlesnake
Reptiles
Snake Charming
Viper

SNAKE BIRD, a name applied to the darter and to the wryneck (both of which see).

SNAKE CHARMING, an ancient art in Egypt and the East, the practice of which, as a means of entertainment, is usually passed from father to son. It is mentioned in the Old Testament and by many classical writers. Occasionally, the serpent charmers cut out the poison fangs of their snakes, to render them harmless, but the custom is not general. The secret of snake charming, with minimum danger, seems to be the possession of confidence

and knowledge of the reptiles' habits. Snakes are fond of music, and the usual way of controlling them is by playing a flutelike pipe. The serpent, resting on the coils of its lower body, will sway the upper part from side to side. Asps have no external ears, so music cannot influence them; regular, rhythmical motion will produce the desired effect, however, and the serpent charmer waves his pipe back and forth. Even professional charmers play tricks only with the safer, hooded varieties.

SNAKE DANCE, a weird ceremonial dance of the Arizona Hopi Indians, in which the dancers, who are members of the Antelope and the Snake priesthoods, carry live snakes in their mouths. Rattlesnakes are principally used, but the reptiles are handled so carefully that the dancers are rarely bitten. After the ceremonial, the entire village indulges in a feast. The snake dance is held every two years, in August, and is a plea to the powers of nature to send rain.

[Efforts have been made to have the United States government prohibit the snake dance, but the wishes of the Indians continue to be respected.]

SNAKE INDIANS. See **INDIANS, AMERICAN** (Most Important Tribes: Shoshoni).

SNAKE KILLER. See **ROAD RUNNER**.

SNAKE RIVER, the largest tributary of the Columbia River. It furnishes an abundance of water power and is largely drawn upon for irrigation purposes. Rising high in the Rocky Mountains of Yellowstone Park, the Snake flows in a southwesterly direction to the southern part of Idaho, turns westward, flows across the state nearly to the Oregon line, and then swings abruptly northward. For 170 miles it forms the boundary between Idaho and Oregon, and for about thirty miles flows between Washington and Idaho. At Lewiston it turns westward into Washington, where it joins the Columbia River, near Pasco. Though the stream is over 900 miles long, its many falls and rapids render it useless for navigation except between the mouth and Lewiston, a distance of 100 miles. The Indians called the river Shoshone, a name which is now given to a cataract at the Idaho-Wyoming boundary.

SNAKEROOT, the name applied to a large number of plants, because their roots resemble snakes, or for the reason that they were at one time believed to cure snake bites. They are found quite generally throughout the United States and in many parts of Canada, and their roots in many instances have medicinal value. *Black snakeroot*, or *cohosh*, yields a drug used in treating Saint Vitus's dance; the roots of *Virginia snakeroot*, or *birthwort*, have tonic properties and have been used to cure rattlesnake bites. As a remedy for the latter, however, they have no real value. Another species, *Canada snakeroot*, or *wild ginger*, has

stimulating properties and is also used as a spice. From *Senega snakeroot* an emetic is prepared. B.M.D.

Scientific Names. Black snakeroot is classed as *Cimicifuga racemosa*; Virginia snakeroot is *Aristolochia serpentaria*; Canada snakeroot, *Asarum canadense*; Senega snakeroot, *Polygala senega*.

SNAPDRAGON, any one of a genus of herbs whose blossoms, when pressed open and then released, fly shut with a gentle snap. Each



Photo: Visual Education Service

SNAPDRAGON

flower consists of a tube, at the end of which are two closed lips. When the flower is pressed open, it is these lips that snap together. The flowering stalks of the most commonly cultivated species, a native of Europe, grace all old-fashioned gardens and make ornamental borders for large flower beds. The velvety texture and the beautiful and varied colors give the blossoms great charm. The stalks, growing three feet high or more, are covered with fine, short hairs, and the small, smooth leaves are somewhat thickened. The common snapdragon lives from year to year, but some species must be grown from seeds each spring. B.M.D.

Scientific Name. The snapdragons belong to the family *Scrophulariaceae*. The common snapdragon is *Antirrhinum majus*.

SNAP JUDGMENT. See **REASON, OR REASONING**.

SNEEZING is caused by irritation of the sensory nerves of the nose. The act itself is a

sudden and violent expiration chiefly or wholly through the nose. It is an example of reflex action (which see), and is a spontaneous effort on the part of the body to remove the irritating agent.

Ordinary cold in the head is usually accompanied by sneezing, and continued and violent attacks are characteristic of hay fever, asthma, and whooping cough, and severe cases of nasal catarrh. Dust, pollen, tobacco smoke, and other outside irritants may cause sneezing. Local applications of menthol or a similar drug to the mucous membranes of the nose will usually allay severe sneezing. K.A.E.

SNIFE, the name of a group of shore birds related to the sandpipers, curlews, and certain other water fowl. The one species found in North America is the *Wilson's snipe*, a bird dear to hunters, both on account of its fine flavor and because its erratic flight taxes their skill. The bird is acrobatic in the air, and has a strange habit of "bleating" or "drumming," a sound that it produces by mounting to a great height and then descending by one quick swoop after another, with the air rushing through its wings. Its summer range is from the Northern United States to Hudson Bay and Labrador, and it winters from Illinois and South Carolina southward. The snipe is more timid than the sandpiper about being seen in the open by day. Its nest is a depression in the ground on the edge of marshes. The eggs are four in number, and their color is olive-brown or grayish-drab, thickly spotted with chocolate. The bird

is about eleven inches long, and has a short tail and a very long bill; a flexible, sensitive tip on the latter is used skilfully in probing for worms and grubs, which are its food. D.L.

Scientific Names. Snipes belong to the family *Scolopacidae*. The Wilson's snipe is *Gallinago delicata*. The common snipe of Europe is *Gallinago gallinago*.

SNOQUALMIE, *sno kwol'-mih*, RIVER. See WASHINGTON (state).

SNORING. One can best describe the disagreeable noise made by a person who snores by saying that it sounds much like the word *snore*. The sounds are produced when the sleeper has his mouth open, and when the air, with every breath that is taken, gurgles through the throat with a hoarse, rattling noise. The physical source of this sound is the vibration of the soft palate and uvula. Snoring is often merely a habit; the mouth drops open mechanically after one falls asleep. Certain mechanical devices for keeping the mouth closed have been tried,



Photos: Visual Education Service; Wide World

A SNIFE IN FAVORED SURROUNDINGS

but without encouraging success. Some people advocate the use of a bandage, placed around the head and tied under the chin. When snoring is caused by nasal catarrh or throat trouble, as is often the case, the only remedy is treatment of the ailment. Children who snore should be examined for nose or throat trouble. In their case it is a danger signal that should not be disregarded. In this connection it will be well to consult EDUCATION (Hygiene of Education, especially the section *Adenoids*). K.A.E.

SNORRI STURLUSON, *snor' re stoor' loo-sun* (1179-1241), one of the earliest historians of Iceland, famed as the author of the *Prose Edda* (see *EDDA*) and of a series of biographies of old Norwegian kings entitled *Heimskringla*. The *Prose Edda*, completed in 1222, is one of the first masterpieces of Scandinavian literature, but was not published until the seventeenth century. Snorri early became prominent as a poet, lawyer, and statesman, and in 1215 was made president of the legislative assembly and higher court of Iceland. In 1218 he visited Norway on the invitation of King Haakon, and when he returned home, he became a vassal of the Norwegian king and negotiated a peace treaty between Iceland and Norway.

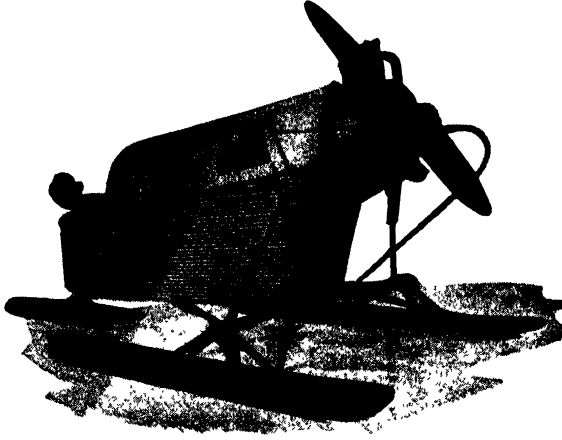
After many years, he lost the confidence of Haakon, and was put to death by the latter's order.

SNOW, *sno*, crystals of ice formed when cloud vapor is condensed at a point below freezing (32° F.). These crystals do not always reach the earth in the form of snow, for sometimes they are partially melted and reach the earth as sleet, and sometimes they are entirely melted and descend as rain. There are millions of boys and girls in the world who never saw a snowflake, for on over a third of the earth's surface snow never falls. Even in some portions of the United States, there are children who do not know what snow looks like, who never see it—

"Flying through the cloudy sea
Out of soft gray mystery,
Lightly, lightly resting,
On the old elm nesting,
Hanging from the hemlock there
Like a beard of silver hair,
Molding on the lilac-tree
Petals of white purity,
Changing to a lovely frieze
Ancient weeds forlorn and gray,
Shivering along the way."

Snow forms in six-rayed ice crystals of different designs, some of which are shown in the illustration, page 6665. It is interesting to collect some of them on a black surface and to study them under an ordinary magnifying glass. The white color of snow is due to the reflection

of light by the tiny facets of the crystals. In Greenland and a few other places, red and green snow has been known to fall. Tiny organisms living in the snow cause the coloration. Snowflakes are combinations of crystal fragments, and have been known to reach a diameter of as much as four inches.



A SNOW-SLED AIRPLANE

A Russian invention, capable of a speed of about seventy-five miles per hour.

Photo: U & U

In Polar regions and on the tops of high mountains, snow falls in all seasons, whereas in temperate regions it falls during the winter months. The heaviest snowfalls occur in the mountains of the cool temperate regions, such as the Alps, the Rocky Mountains, and the Sierra Nevada range in California. These heavy snowfalls have always been a grave danger to persons journeying through the mountain

passes, and in Europe houses of refuge are maintained for the sake of protecting such travelers. The most famous refuge is that in the Alps at the Saint Bernard Pass. Even twentieth-century travelers, on swift and luxurious trains, are endangered by the winter snows, the snowslides, and the avalanches which occur in mountainous regions. Railroads protect their tracks by constructing great wooden snowsheds at danger points, but powerful snowplows often have to be used to keep the lines open.

The amount of water in snow is much less than in rain, a rainfall of one inch being equal to a snowfall of about ten inches. Since the melting of snow on mountains supplies water for streams, hydroelectric-power plants, and irrigation reservoirs, mountain snow is of great economic importance.

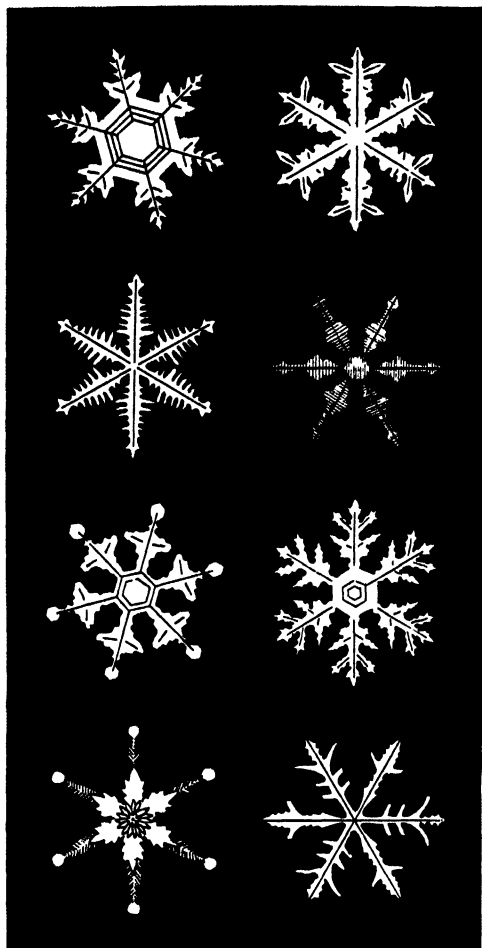
R.H.W.

Related Subjects. The following articles in these volumes will be of interest in this connection:

Avalanche	Freezing	Ice	Snowplow
Crystallization	Glacier	Snow Line	Snowshoe

SNOWBALL, OR **GUELDER-ROSE**, *gel'-dur rose*, a handsome flowering shrub of the honeysuckle family that is often seen in parks and on lawns. It is a cultivated form of high-bush cranberry and grows from seven to twelve feet high. The first and more common name refers to the large, ball-like, white flowers, which grow in great profusion and bloom in June and July. The term *guelder-rose* is derived from the name of the Dutch province of

Guelderland, where the plant is supposed to have originated. The flowers of the cultivated plant are all sterile, that is, do not produce



"THE BEAUTIFUL SNOW"

The term is not the fanciful expression of the poet, for nothing exceeds the beauty and symmetry of the feathery flakes. In the illustration the forms are greatly magnified.

fruit, but there is a wild guelder-rose that bears juicy, red berries. B.M.D.

Classification. The botanical name of the snowball is *Viburnum Opulus sterile*.

SNOW BIRD. See BUNTING; JUNCO.

SNOWBOUND. See AMERICAN LITERATURE (National Period).

SNOW BUNTING, OR SNOWFLAKE, a sparrowlike bird which may be distinguished from all other North American birds by the large amount of white in its plumage. Not only on its body, but on its wings and tail as well, white predominates. Except in unusually

cold winters, when the snowfall is very heavy, these birds do not venture as far south as the Northern United States, but in Canada they are among the most familiar of winter visitors. Their summers are spent in the Arctic regions. Ernest Thompson Seton says of this bird:

In midwinter, in the far north, when the thermometer showed thirty degrees below zero and the chill blizzard was blowing on the plains, I have seen this brave little bird gleefully chasing his fellows, and pouring out as he flew his sweet, voluble song with as much spirit as ever skylark has in the sunniest days of June.

Snow buntings feed on weed seeds and insect life. They are harmless and deserve protection. See BUNTING. D.L.

Scientific Name. The snow bunting belongs to the family *Fringillidae*. It is classed as *Passerina nivalis*.

SNOWDEN, PHILIP. See WAR DEBTS.

SNOWDON, MOUNT. See WALES (The Land).

SNOWDROP, any one of a genus of flowering plants of the amaryllis family, so named because they bear delicate white blossoms that seem to be made out of snow. The common snowdrop of the gardens is one of the hardiest of the out-of-door plants, for it has been known to bloom in midwinter in localities where warm spell has caused the surface of the ground to thaw. The snowdrop grows from a small, bulbous root, from which spring two or three narrow green leaves and a leafless flower stalk. The nodding, bell-shaped flowers grow singly at the top of the stalk, and usually come into blossom in March or April. The plant is easily cultivated, for the bulbs can be planted in a sheltered place and be left to themselves. The snowdrop needs little attention. In England the people call it the *Fair Maid of February*. See AMARYLLIS FAMILY.



Snowdrops that plead for pardon.

—SWINBURNE.

The snowdrop needs little attention. In England the people call it the *Fair Maid of February*. See AMARYLLIS FAMILY. B.M.D.

Scientific Name. The botanical name of the common snowdrop is *Galanthus nivalis*. The family is *Amaryllidaceae*.

SNOWFLAKE (bird). See SNOW BUNTING.

SNOW GUM. See EUCALYPTUS.

SNOW LEOPARD. See OUNCE.

SNOW LINE. Even in the Torrid Zone, mountains rise into air that is so cold that snow lies on their upper slopes all the year. The lower edge of these permanent snow fields, in whatever country or zone, is called the *snow line*. The line is affected by prevailing winds, temperature, and moisture, and varies in the same locality from year to year. It is about three miles above sea level in the tropics, about two miles in the Rockies, approximately a mile and two-thirds in the Alps, a little more than a mile in South Chile, and less than a half mile in Greenland. It descends to sea level in the Frigid Zone, where permanent snow may be found even on the lowlands.

Related Subjects. The reader is referred in these volumes to the following articles:

Climate Irrigation Mountain Snow

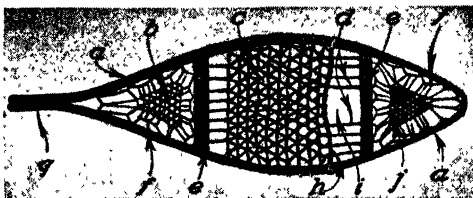
SNOWPLOW, a machine for clearing the snow from railways and roads. In the United States and Canada, where the snowdrifts are of great depth and liable to be packed hard by violent winds, the railroads are usually cleared by a rotary plow, which consists of a wheel nine feet in diameter and provided with a series of knives or scoops. The wheel is kept revolving by a special engine, which is placed with the plow in front of a locomotive. The scoops feed the snow into a hopper, from which it is blown to a considerable distance by a powerful fan. With a rotary plow the deepest drifts can usually be penetrated.

Where the snow is not so deep, a triangular plow, with its apex in the center of the track, is used. Pushed forward by a locomotive, the triangle forces the snow off the track at each side. The triangular plow is also used for clearing roads and sidewalks, but cannot be used in any great depth of snow.

The clearing of the railroads of the United States and Canada from snow annually costs many thousands of dollars, but so efficient have modern snowplows proved that drifts that would formerly have entirely suspended traffic can now be cut through with comparative ease.

SNOWSHOE, a contrivance to aid in walking on snow, consisting of a light wooden frame, bent in an elongated oval, across which is stretched a web made of deerskin thongs, strung much like a tennis racket. The snowshoe is provided with supports and holders for the feet. The principle applied is that of distributing the weight of the body over a considerable area, thus enabling the yielding surface of the snow to support it. Such shoes are used by hunters, trappers, loggers, and farmers in countries where the snowfall is deep.

In addition to these practical uses, in the principal cities and towns of Canada there are uniformed clubs whose members find snowshoeing a means of recreation for the long winter evenings. The styles of shoes vary according to the use to be made of them, and the surface features of the country where used. A nearly round form is known as the *Montagnais*, or



PARTS OF A SNOWSHOE

(a, a) Frame, or bow; (b) heel filling; (c) center filling; (d) toe stays; (e, e) crossbars; (f, f) lanyard; (g) tail; (h) toe cord; (i) toe hole; (j) toe filling.

mountain shoe. Long and narrow shoes are known as the *Klondike*; there are all forms between the two.

The snowshoe as used in the United States and Canada was originated by the Indians, and the most expert users of them to-day are the trappers of Eastern Canada. A novice will find it hard to walk even at a slow pace when wearing snowshoes, but expert trappers will walk for hours at a rate of five or six miles an hour on a good, hard-surfaced snow, and many will run at a "dogtrot," covering easily thirty-five or forty miles a day. The wearing of snowshoes makes it possible, and easy, to walk across snow-covered areas in which one without them would sink to a depth of five or six feet, a depth by no means uncommon in the woods of Canada.

SNOWY RANGE, a term sometimes applied to the Sierra Nevada Mountains. See CALIFORNIA (Surface Features); SIERRA NEVADA.

SNUFF, a fine powder made from the stems and leaves of the tobacco plant, which have been fermented by heat and moisture, then dried and ground. Snuff is inhaled through the nostrils or rubbed on the gums. Various mixtures of flavors or scents are added to make the powder pleasant for inhaling. Formerly, it was considered a matter of etiquette to offer "a pinch of snuff" to friends whom one met, for each person carried a snuffbox. This practice is still prevalent in Southern Europe, and many allusions are made to it in literature. Pope says, in the *Rape of the Lock*:

Sir Plume, of amber snuffbox justly vain,
And the nice conduct of a clouded cane.

The habit of taking snuff is very injurious. One of its effects is irritation of the nerves of smell and deterioration of ability to distinguish odors. A user of snuff is deprived

of his best protection against foul air. See SMELL.

G.M.S.

SOAP, a manufactured product which is an indispensable aid to cleanliness. Its ingredients are very largely fats and oils, including tallow, lard oil, palm oil, olive oil, cottonseed oil, coconut oil, corn oil, stearin, and crude oleic acid. In its manufacture a few commonplace chemical ingredients become important. We are concerned in this article with household soaps only, without reference to certain special requirements, such as are demanded in the fine arts and in pharmacies. Two varieties are commonly known—hard soap and soft soap. That which contains a potassium treatment in the making is soft soap; the hard variety is a sodium compound.

Soap-making to-day is a scientific development of the methods once employed in homes for the making of soft soap, when our great-grandmothers saved all greasy substances from their kitchens, to be boiled down and treated with lye which they distilled from wood ashes. Their soap was yellow, because of the potash in the lye. The housewife knew how to continue the process and produce hard soap, by using brine, which is salt in solution. The potassium in the soft soap was thus replaced by the sodium in the brine; the part that was soap rose to the top of the receptacle—a large iron kettle over a fire in the backyard—and when it cooled, it solidified. Soap is yet made in the above manner in isolated sections of many countries.

Soap Manufacture. Rosin, or laundry, soaps are made from tallow, which may be mixed with grease or oil. In the course of the manufacturing process, rosin is added to give the soap its characteristic yellow color. The fatty material, known technically as *stock*, is poured in a liquid state into a sheet-iron kettle heated by steam coils. During the heating process, lye is added to the mixture from time to time, and when the contents have the appearance of a thick gum, saturated salt solution is added until the soap floats on the surface. The mixture is then cooled, and in this process the brine sinks to the bottom of the kettle. The brine is then drawn off and worked for glycerine and salt, while to the soapy layer fresh, strong lye and rosin are added. The resulting mixture is heated until the rosin is thoroughly united with the soap. Then a salt solution is added as before; the lye is drawn off; fresh, strong lye added; and the mass boiled again. After further cooling, settling, and reheating, and the addition of cold water, the contents of the kettle are allowed to cool off slowly to a temperature of about 65° C.

The soap is next run into a horizontal revolving cylinder known as the *crutcher*, in which it is stirred until the mixture is of a uniform color and texture. Various chemicals, such as

carbonate of soda, are added to improve the quality. Finally, the mixture is run into molds, where it is allowed to harden into huge cakes. These are cut into bars by steel wires and wrapped by machinery for the market. Some machines will wrap about 100,000 bars a day.

Toilet soaps require several other processes, but the crutching operation is omitted. These soaps are usually scented with various ingredients, and they also have different coloring matters added. Cheap, highly scented soaps should be avoided, as the perfume is often added to disguise the presence of offensive fats. As a general rule, a healthy skin is best served by the use of a soap made from pure oil and good soda.

Some so-called medicated soaps advertised in the markets are frauds, and the advice of a reliable physician should be sought if one is tempted to try a soap for a skin disorder. Transparent soaps contain alcohol and glycerine, and floating soaps are usually a mixture of tallow and coconut oil, potash, and soda. Sailors use what is known as *salt-water* soap, made from coconut oil, potash, soda lye, and salt. The popular Castile soap is made from olive oil and soda or mixed potash. The so-called naphtha soaps usually contain kerosene.

In the manufacture of soap, glycerine is also produced as an important by-product (see GLYCERINE).

Before Soap Was Known. In the centuries before the Christian Era, people "bathed" by anointing their bodies with olive oil, and then for cleansing used fuller's earth and plant ashes. Just when soap was first made is not known; the Germans claim that it was made in their country in the first or second century B.C., but the most authentic accounts place its first use in the first century A.D.

Soap Bubble. If air is blown into a film of soap solution, bubbles are formed. The water which forms the surface of the bubble is composed of molecules which exert toward each other a force of attraction. This is called surface tension. The pulling power of the molecules makes it possible to stretch the film until the surface tension will no longer hold the bubble together.

Surface tension exerts a pressure on the air within. Since it presses equally in all directions, the bubble assumes a round form. When bubbles are blown by air from the lungs, this air is warmer than the surrounding air. Hence, it tends to rise; just as hot air will cause a balloon to rise. As soon as the air cools, the bubble will fall.

The colors seen in soap bubbles are due to the interference of the light waves reflected from the two surfaces (inner and outer).

SOAPSTONE. See STEATITE.

SOCCER, sok' ur. See FOOTBALL (Association Football).

SOCIALISM, *so' shal is'm*, a political world movement which seeks to adjust the relation of the individual to the community by means of collective ownership and management of the means of production and distribution.

The term *socialism* seems to have appeared first in England in 1833, in a paper called *The Poor Man's Guardian*, during discussions which arose in regard to an organization called the *Association of All Classes of All Nations*. As this society was for the purpose of social reconstruction, the name was considered well applied. French and German writers recognized the term and it soon came into general use, but it was in Germany that it first acquired political significance. The word has been much abused, having been used to describe communism, anarchism, and almost everything of a revolutionary nature in the political world. The only proper use of the word to-day is in its application to one of the most remarkable movements of the nineteenth century, that of the so-called Socialist party.

Socialism first became connected with politics in Germany, the native land of Karl Marx, who, by careful researches, developed economic theories which revolutionized the existing ideas regarding the relations of the various classes in society. In 1847 Marx and Engels published the *Communist Manifesto*, which explained scientific socialism in language intelligible to the laborer. This *Manifesto*, which continues to strike the keynote of socialism to-day, was written as propaganda to arouse a people not accustomed to political power, and to make them class-conscious. Fourteen years later, Ferdinand Lassalle, a disciple of Marx, incorporated the Marxian principle into the program of a political group in Germany, called the Social Democratic party. There the movement gained ground rapidly, perhaps because the people to whom it appealed had only recently been enfranchised, and therefore had no established party affiliations.

In the United States. The development of the theory of social evolution and the spread of socialism as a party movement have been rapid in America. In 1888 the Socialist vote in the United States was 2,068; in 1904 it had grown to over 402,000; in 1912 it was 897,011; and in 1920, when the nominee, Eugene Debs, was in prison, it reached 919,799. There was a falling off of Socialistic influence because of the party's attitude toward American participation in the World War, but the party maintained its organization and threw its strength to the support of Robert La Follette in 1924. It is believed to have then had a voting strength of about 1,000,000. In 1928 the vote fell to 267,835, as considerable radical support went to the Democratic nominee, Alfred E. Smith. The future of the party as

such is in doubt, but it has been an educational force in that it has kept many issues before the public.

The best means of determining what are the principles of socialism, as held by adherents of the party in the United States, is to study the "working program" or platform of the party, which is regarded as a definite pledge.

The program of the party declares that its measures are calculated to strengthen the working people in their efforts to effect a coöperative commonwealth, which is the ultimate aim of the party, and to increase the power of resistance against what is termed capitalistic oppression. The platform is stated under three heads, Collective Ownership, Industrial Demands, and Political Demands; with the latter is included Unemployment Demands, seeking to secure government employment for all men out of work.

Collective Ownership includes the ownership and management of railroads, telegraphs, and telephones, express service, steamboat lines, "and all other social means of transportation and communication and of all large-scale industries." It includes the immediate acquirement by the government of such agencies as can be made to reduce the cost of living, such as grain elevators, stockyards, and storehouses. It asks for government ownership of mines, quarries, oil wells, forests, and water power; and the conservation and development of all natural resources for the benefit of the people. The collective ownership and democratic management of the banking and currency system is demanded; the collective ownership of land, wherever practicable, and where not practicable, an appropriation by taxation of the rental value of such land as is held for speculation or for exploitation of any kind.

The Industrial Demands are for the better protection of workers and their families. They include the shortening of the work day, in proportion to the increasing productiveness of machinery; securing to every worker a rest period of at least a day and a half each week; better inspection of workshops, factories, mines, etc.; refusal to employ children under eighteen; a plan for giving convicts and their families the benefit of convict labor; the forbidding of interstate transportation of the products of convict labor, child labor; and that of uninspected factories and mines; the abolishing of the profit system in government work and substituting either the direct hire of labor or the awarding of contracts to coöperative groups of workers; the establishing of a minimum wage scale; the abolishing of public charity and substituting a system of old-age pensions and social insurance which shall protect every worker against unemployment, sickness, and accident. Mothers' pensions are also demanded.

The Political Demands are absolute freedom of press, speech, and assemblage; increase in the rates of the income-tax law; increase of rates of the corporation tax; the extension of inheritance taxes, graduated according to the value of the estate and the nearness of the kin, and the use of the proceeds from all such taxation for the socialization of industry; the abolition of personal or corporate ownership of patents, and the substitution of collective ownership, with a system of direct payment of the inventors by the government, by means of premiums or royalties; unrestricted and equal suffrage for men and women; universal adoption of initiative, referendum, recall, and proportional representation; the abolition of the veto power of the President; the abolition of the Senate; election of President and Vice-President by direct vote; abolition of the power of the Supreme Court of the United States to pass upon the constitutionality of the laws enacted by Congress; repeal of national laws by referendum vote of the people; abolition of restrictions upon amendments of the Constitution, so that it may be amended by a majority vote of the people; granting the right of suffrage in the District of Columbia, with representation in Congress, and a democratic form of government for local affairs; a democratic form of government for all United States territory; the Bureau of Education to be raised to the rank of a department of the government; extended measures for general education, with a plan for vocational training in the useful pursuits; a Bureau of Health and further measures for the conservation of health, with full liberty to all schools of practice; the abolition of Federal District Courts and of United States Circuit Courts of Appeal; a law by which state courts shall have jurisdiction in cases between citizens of the various states and foreign corporations; the election of all judges for a short term; curtailing the power of courts to issue injunctions; the free administration of the law; the calling of a convention for the revision of the Constitution of the United States.

As a World Movement. The International Socialist party is represented in every country that has reached an industrial stage. In 1901 the Canadian Socialist League was organized, and while the Socialist vote in Canada has not been large, there has been a steady growth noticeable at all elections. In Australia and New Zealand, the Socialist party as such has been kept in the background by the powerful Labour parties, which have led the industrial reforms, but the Socialists claim that the Labour parties, too, are working toward social democracy. Many of the social and political reforms demanded by the American Socialist party have been incorporated in the governmental structures of Australia and New Zealand.

In Europe the most radical elements among the Socialistic bodies have gone over to Communism (which see). The Communists are minority bodies in England, France, and Germany, but are more powerful than in the United States, where the movement is sternly suppressed. In England the powerful Labour party, which came into control of the government in 1924, and again in 1929, has in its ranks large numbers of Socialists, so that a Labour party victory is partially a victory for Socialism. In France the Socialists, as a political party, have control of the Chamber of Deputies, and at times dictate the policies of the government. The first German President was a member of the Majority Socialist party, and the various groups using the name Socialist make up the strongest element in the Reichstag. There have been Socialist governments in Sweden and Denmark, and representatives of the Socialist group in the Cabinets of Belgium and other countries. In Italy, where there was once a strong Socialist party, political power has gone into the hands of the Fascists.

E.J.

Related Subjects. The following articles in these volumes will make clear many of the references in the above discussion of socialism, and will give added information:

Anarchism	Labor, Department of
Bolsheviki	Labor Organizations
Child Labor	Minimum Wage
Communism	Marx, Karl
Convict Labor	Mothers' Pensions
Debs, Eugene	Political Parties
Fascism	Old-Age Pensions
Income Tax	Recall
Inheritance Tax	Sabotage
Initiative and	Suffrage
Referendum	Syndicalism

SOCIALIST PARTIES. See SOCIALISM.

SOCIAL PRECEDENCE, *preh seed' ens.* From the earliest days of an ordered civilization, there have been individuals, castes, or classes of society that have assumed, or have been granted, precedence over others in social affairs. Thus, to go no further back than the Middle Ages, nobles and knights, in order of rank or of age, sat at table above the salt, while their retainers sat below. Precedence, in this sense, implies recognition or consideration of individuals according to their rank or dignity; it means priority of place, or superiority, in the conventional system of arrangement under which the more eminent and dignified orders of the community are classified on occasions of public ceremony and in the intercourse of private life.

In European countries, under the monarchical system of government, an order of precedence has long been clearly established and has been generally accepted as necessary to avoid social conflict and confusion. It has always been the custom, at every court, to establish a definite order of precedence for the various ranks of the nobility, for officers of state, for

the higher clergy, and especially for the representatives of foreign powers, who are invariably jealous of maintaining the prestige of their respective countries. Thus, ambassadors have ranked above ministers, and the ambassadors themselves have ranked according to the importance of the countries they represented, or according to length of service in the diplomatic corps. With court chamberlains as arbiters of social precedence, the problem has been simplified; but in democracies, it would seem that, in the very nature of things, there could be no precedence, except that allowed by common consent to persons of distinguished merit and in the case of officers of the army and navy. Nevertheless, in some democracies, the problem at times becomes difficult.

In Great Britain, the order of precedence is well established and closely observed. The sovereign and his immediate relatives take precedence over all others. Then follow the ambassadors, the archbishop of Canterbury, the Lord High Chancellor, the archbishop of York, the Prime Minister, the Lord President of the Council, and the Speaker of the House of Commons, in the order named, followed by dukes, marquises, earls, and the lesser orders of the nobility, with state officers, bishops, judges, and sons of peers interspersed according to a definite plan, down to the younger sons of knights and "naval, military, and other esquires by office." Women take the same rank as their husbands or as their eldest brothers; but merely official rank on the husband's part does not give any similar precedence to the wife.

In the United States, and especially in the capital, the problem of social precedence, strangely enough, has become in recent years one of seemingly increasing importance and difficulty. This was especially evident upon the inauguration, in March, 1929, of a Vice-President who was unmarried, and who designated his married sister as his official hostess. There being no social arbiter, like a court chamberlain, in the American system of government, the problem agitated official and social circles for some weeks, and led to the promulgation in April, 1929, of the following "official order of precedence for seating guests at official dinners in Washington":

1. The President and his wife.
2. The Vice-President and his wife, if he has one.
3. The Secretary of State and his wife, the Secretary being regarded as the heir presumptive after the Vice-President.
4. The ambassadors, headed by their dean, they being representatives of their sovereigns and not of their governments.
5. The Chief Justice of the Supreme Court, he being the head of a coördinate branch of the government.
6. The Speaker of the House of Representatives and his wife.

7. The remainder of the President's Cabinet, headed by the Secretary of the Treasury, and following in line of succession to the Presidency.

8. The remainder of the Supreme Court, headed by the senior member after the Chief Justice.

9. The ministers of thirty-five nations.

10. Members of the Senate, headed by the president pro tempore of the Senate, and his wife.

11. The commanding generals and admirals of the army, navy, and marine corps, ranking with Senators.

12. Members of the House of Representatives in order of seniority.

13. Chargés d'affaires of foreign nations.

14. The Assistant Secretary of State.

15. Minor officials of embassies and legations.

16. Minor officers of the army, navy, and marine corps.

After following the above order of precedence, the host must decide for himself how the remaining guests are to be seated. It may be added that, at the most important official functions in Washington, the right of an unmarried Vice-President to designate a relative as his official hostess has been generally recognized. Humor was lent to the situation while this question was being discussed, and American democracy was at least partially vindicated, by the remark of a distinguished agricultural visitor to Washington, that he would be willing to dine at the "second table," as on the farm, or to "eat in the kitchen with the help." T.H.R.

SOCIAL SETTLEMENT, an institution that represents one phase of the great modern movement for the uplift of humanity from the vice and ignorance arising in congested centers of great cities. In these centers, men and women of education and culture live and work, striving to relieve the sordid and disheartening conditions that surround their less fortunate brothers and sisters.

Social settlements carry on many activities, chiefly of an educational and recreational character (rather than charitable), such as kindergartens, schools in citizenship, clubs, classes, libraries, baths, savings banks, etc., and they usually keep open halls where community groups may hold social, political, or religious gatherings. They are headquarters for all kinds of welfare movements, and often institute reforms, based on their social studies and investigations, that are afterward taken up by the city or state.

The first social settlement was founded by men of Oxford University, in London, in 1884. It was the outgrowth of the work begun in Whitechapel, a crowded district in East London, by Arnold Toynbee, and is known as Toynbee Hall. In 1887 Dr. Stanton Coit established the Neighborhood Guild in New York, which grew later into the University Settlement. In 1889 Jane Addams and Ellen Gates Starr of Chicago opened Hull House, now one of the best-known social centers in the United States. Since that time, settlements and settle-

ment methods have become common in great cities.

L.L.B.

Related Subjects. The reader is referred in these volumes to the following articles:

Addams, Jane
Community Interests

Hull House
Tenement

SOCIAL SURVEY. See SOCIOLOGY (Applied Sociology).

SOCIAL WAR. See ROME (Last Century of the Republic).

SOCIAL WORK, CONFERENCE OF. See SOCIOLOGY (Applied Sociology: Transition from Relief to Reconstruction).

SOCIETY ISLANDS. See PACIFIC ISLANDS.

SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS. See CRUELTY TO ANIMALS, SOCIETY FOR THE PREVENTION OF.

SOCIETY OF FRIENDS. See QUAKERS.

SOCIETY OF JESUS. See JESUITS.

SOCIETY OF THE CINCINNATI. See CINCINNATI, SOCIETY OF THE.

SOCIOLOGY, *so shih ol' o jie*, the study of the human race, including its history, evolution, present condition, and probable future, the laws which govern its development, and the place of the individual in relation to society. The scope of sociology is necessarily broad. History, ethnology, civics, economics, anthropology, ethics, psychology, philosophy, and, above all, biology—all the sciences which treat of human beings and the conditions under which they live—are related to and contribute to sociology. This science rests on the assumption that all human experience depends on three things: the physical conditions under which life is maintained, the relation of the individual to other individuals and to society, and the types of association in which individuals influence each other. Before it can begin its research, sociology must have data on all these subjects, and so it goes for its part of statistics to the other social sciences. With the data which he gathers from every source, the sociologist endeavors to fix the laws and conditions of the reactions between nature and human beings, both as individuals and in the group; he is studying the evolution of human personality, the processes which result in types of individuals and of associates, types which act on each other in an endless cycle of cause and effect.

Other sciences—physics, chemistry, mathematics—rest on relatively unchanging, invariable laws. These sciences have reached the stage of development at which the ordinary phenomena of everyday life pertaining to them have been thoroughly investigated and generalized into definite and exact laws and formulas. Isidore Auguste Comte, when he first outlined the field of sociology and gave it its name, held that it, too, might be an exact and invariable science; but human behavior is much more complex than physical phenom-

ena, and has not yet been so completely studied or so accurately and definitely generalized. Biology, the study of all life, is the great foundation for the study of human life, and biology is even now in an unfinished state. Psychology, which studies the behavior of the human organism in its psychic contacts with its environment, is even less of a developed science, and it also is fundamental to sociology.

Important as is the biological heredity of the individual, his social heritage, although interlocked with the biological, forms the essential subject matter of sociology, and demands observational and scientific study of its origin and development, and especially of the methods by which it operates to form personality and to determine human association.

The five chief classes in the formal study of sociology—each class, in turn, is divided and subdivided—are (1) *descriptive sociology*, which includes all the preliminary work of stating observed phenomena; (2) *social psychology*, which covers the study of the growth of personality and the behavior of groups; (3) *social ethics*, which studies the social consequences of behavior, criticizes traditional theories and canons of social policy, and defines social objectives; (4) *social technology*, the application of known social facts and principles to the bettering of social conditions; and (5) *social investigation*, which applies scientific methods to the study of social phenomena and the formulation of sociological principles and laws. The true sociologist, loving his science, might well take his motto from Terence: *Humani nil a me alienum puto*—"I consider nothing human to be unimportant to me."

L.L.B.

Applied Sociology

A modern sociologist investigates the behavior of men in groups, as a natural scientist studies a hive of bees. In this way, methods for taking stock of human relations have been perfected. As an engineer maps a region to find the best line for a road, social workers now examine a community to discover what can be done to improve it. This system of plotting conditions is called *the social survey*.

Gathering and Measuring Facts. During the last decade of the nineteenth century, Charles Booth directed an investigation of living conditions in London, which showed that nearly thirty-one per cent of the people in that city were in poverty. Some years later, the staff of Charities and The Commons conducted a survey of the steel industry about Pittsburgh, and disclosed its harsh circumstances. Since then, in many places, similar explorations of neglected corners of community life have been made. The Russell Sage Foundation established a department to help cities take stock of their social resources. Cleveland

devoted a fund to keeping track of its public agencies. The University of Chicago organized a laboratory to study and chart the currents of human activity in the region about it. Such field work has yielded a mass of information about the conduct of men in groups, and has tested definite ways of gathering this knowledge.

When we have found a number of facts, the next step is to arrange and measure them. In order to clean out a city slum, we need to know exactly how many tenements must be pulled down, the number and kinds of people to be lodged elsewhere, and how much the shift will cost. This requires counting, classifying, and calculating definite amounts. So in studying human groups, sociology now uses precise mathematical statements, wherever this is possible. The application of quantitative measurement to social groups is an extension of statistics.

Investigating Living Standards. Although measuring wages and prices is primarily a task for economists, determining a reasonable standard of living concerns sociologists. During the third quarter of the last century, Frederick Le Play gathered data upon workingmen's budgets in Europe. From 1900 to 1902, the United States Bureau of Labor investigated the incomes and expenditures of American wage-earners. Since then, many studies have been made by public and private agencies, to find what level of health, comfort, and security is required by workers. Minimum-wage commissions in several states and countries have fixed basic rates of pay, established by conditions in their communities and by the nature of the businesses concerned. The United States Bureau of Labor Statistics publishes monthly an index showing changes in the cost of living. This presentation of actual conditions has proved a useful reference in adjusting wages.

Many other social agencies, such as insurance and pension bureaus, require exact information about the number of people and the amounts of money involved. Every reputable welfare institution is expected to publish a report showing the extent of its work and the disbursement of its funds. Such reports enable students of society to understand the size, character, and treatment of such problems as poverty, disease, and crime.

Grand totals and averages tell little about individual cases. To understand the causes and personal consequences of general conditions, we must investigate the histories of representative men and women from various social classes. The method of tracing the development of individual characteristics is much like that of a physician in studying the course of disease in a patient. For this reason, it is called *the case method*.

The Case Method. The charity-organization movement, which originated in London in 1868 and quickly spread to America, emphasized, as one of its principles, careful investigation and registration of all applicants for aid. The records of modern relief societies have spaces for entering important items concerning the history and connections of every family treated. From such information, the cooperating agencies are supposed to outline a plan of treatment.

One of the most interesting recent developments of case work is the application of methods used by psychologists to discover the causes of mental disturbances. These are frequently found to spring from unfortunate experiences in early childhood, or from worries attendant upon bad living conditions. From studying the background of juvenile delinquents, there has been gathered a store of knowledge helpful for the guidance of parents and teachers. Well-equipped juvenile courts now include persons trained in this field. Smith College and Johns Hopkins University have special departments for preparing such workers. The idea of forestalling much unhappiness by wise treatment of abnormal persons has been spread by the National Committee of Mental Hygiene.

Transition from Relief to Reconstruction. In tracing the causes of social ills, it has been found that cases of poverty, disease, and crime are often merely end results of bad conditions in the community. Moreover, these conditions are permitted to exist because many people assume that they cannot be changed. Thus, poverty and disease are believed to be necessary evils. Modern social workers do not support this opinion. They admit that alms and medicine are necessary for those who suffer from past misfortune and neglect, but they also try to remove the conditions that produce poverty and sickness. They even offer suggestions toward better ways of organizing common life. This changing point of view may be called the transition from emphasis upon relief to that of social reform and reconstruction.

The Minority Report on the English Poor Law (1909) is a striking example of this change. The report makes plain the fact that not all poor people are dependent for the same reasons. It recommends that children be educated, that sick people be treated by the health authorities, that the unemployed be assisted to find work, and that the aged be granted pensions. This program calls for constructive effort by public authorities, instead of doles. The fact that the National Conference of Charities and Correction in the United States has changed its title to the Conference of Social Work points in the same direction. Agencies dealing with delinquents

now consider reformatory treatment and means for wholesome recreation, as well as punishment and prison discipline. This tendency has broadened and deepened the meaning of social work.

Community Organization. As acts of personal charity have been replaced by agencies dealing with hundreds of cases, these agencies have been obliged to develop better ways of working together. Private organizations have united in federations to secure funds and plan campaigns together. In some cases, public institutions have taken over the work of volunteer societies, and have thus expanded their efforts. This is particularly noticeable in the use of schoolhouses and park playgrounds to enlarge opportunities for recreation in New York and Chicago. Other places have combined both public and private agencies through a central council, in order to promote health or education in the widest possible way. This tendency to get together and work for the common welfare is an aspect of community organization.

The need for such procedure is illustrated in the treatment of unemployment. Private charity and union benefits may for a while help to bridge the gap between busy seasons. In order to find jobs for those who are out of work, a labor exchange must be set up to register all the openings and all the applicants. This can best be done by a public bureau. When industry cannot employ more workers, the local government may undertake public improvements, such as road-building or the construction of docks. For industries that are slack during certain seasons, a plan of insurance may be worked out, as has been done in England. But to keep some trades running evenly, the public must be led to plan their purchases ahead, and not place all their orders within a brief period. Working together to smooth out these waves in business has increased our understanding of the common basis of credit, trade, and industry.

Growing Humanitarianism. As knowledge of underlying conditions has grown, social workers have come to see that many local difficulties are merely evidences of widespread disorder. State and national organizations have been formed to meet these general situations. In some cases, it has been found necessary to make international agreements, in order to compass all the factors. This movement toward wider coöperation is practical evidence of growing humanitarianism.

For instance, the sale of opium may appear as a menace to people in American cities. It is soon found that the drug has been bought from a factory in another state, or has been smuggled across a national boundary. So international conferences are held to check the manufacture of morphine in England, and

to limit the growth of poppies in Persia. The same principle applies to the use of alcohol, and other international problems considered by the League of Nations. H.B.W.

Related Subjects. In connection with this discussion of sociology, the reader will find much that is of interest in the articles on the contributing sciences named above. He may also consult the following:

Census	Illiteracy
Charity	Juvenile Court
Child Labor	Marriage
Children, Societies for	Mothers' Pensions
Communism	Old-Age Pensions
Community Interests	Oneida Community
Comte, Isidore A.	Pauperism
Crime	Polygamy
Debt	Population
Divorce	Prohibition
Emigration and	Registration of Births,
Immigration	Deaths, and Marriages
Environment	Socialism
Eugenics	Social Settlements
George Junior Republic	Suicide
Heredity	Temperance
Hull House	Tenement

SOCKEYE, a species of salmon (which see).

SOCRATES, *sok' ra teez* (469-399 B.C.), one of the greatest of the Greek philosophers, was born in Athens. He received only a meager education in his youth, but later became familiar with the best philosophy and thought that the highly cultured Athenian society could offer. For a time his career was that of sculptor, but soon he began to walk the streets and market places, talking to anyone he might meet regarding his soul and the moral life of man in general. From 432 to 429 B.C., he was in military service; he fought at Delium in 424 and at Amphipolis in 422, but refused to take further part in public affairs after the naval Battle of Arginusae, when the mob unjustly demanded the death of ten generals who had been unable to bury the dead.

As a teacher, Socrates was not popular among the citizens of Athens. His personal appearance was against him, for he was bald, had thick lips, a flat nose, ungainly figure, and beggarly costume. He tried to reduce his wants to a minimum in order thus more closely to resemble the gods in their perfection. His wife Xanthippe (which see) has passed into tradition, possibly without proper basis of truth, as a scolding, arrant shrew whom he endured as a form of self-discipline.

He had many illustrious friends, among them Plato, Crito, Alcibiades, Xenophon, Phaedon, Euclid of Megara, and Aristippus. However, his chief work was among the Athenian youths, whom he felt called upon to conduct through love to a nobler moral life. Self-knowledge was his ideal; "Know thyself," his maxim. To him wickedness was the result of ignorance. The good, the useful, and the beautiful were declared by him to be identical. No man is willingly bad, he argued, and love of virtue can be taught. The best rulers are those who are wisest, not necessarily the best educated,



Photos: Visual Education Service; Keystone

Socrates and His Prison at Athens. Unjustly condemned on the charges of impiety and of corrupting the minds of the youth of Greece, the philosopher drank the cup of poison hemlock. At right, a bust of Socrates, whom Milton pronounced, in *Paradise Regained*, "well inspired, wisest of men."

for they will most readily know how to make the people happy.

His method, known as the Socratic, became famous throughout the Mediterranean countries. It was an art of cross-examination which lured even the wisest into contradictions. He veiled his own knowledge behind a professed ignorance, and by a series of carefully directed questions brought out from his hearers the truth he sought.

In 399 B.C. Socrates was condemned to death, because he had introduced new gods and failed to worship the city divinities, and because, it was charged, he had corrupted the youth. During his trial, he gave the famous defense known as the "Apology of Socrates," but the jury, consisting of over 500 members, condemned him by a small majority. On the morning of the day of his death, his scolding and quarrelsome wife Xanthippe was banished by him from his cell, because of the violence of her grief. He is said to have spent the last hour in tranquillity, discoursing with friends on the immortality of the soul. When twilight appeared, he drank the poison hemlock, the cup reserved to those condemned, walked up and down, then lay down on his couch, and died in quiet.

The Socrates who frequently exclaimed, "How many things there are that I do not need," Plato eulogized as follows after his death: "Thus died the man who, of all with whom we are acquainted, was in death the noblest, in life the wisest and most just."

SODA, the general name of several sodium compounds occurring in nature in natural alkaline waters. The term *soda* is employed more commonly, however, to designate certain commercial compounds used in the household and in the industries. The sodas of commerce are manufactured by various processes from common salt. One kind, known in chemistry as *sodium carbonate*, is employed in the manufacture of glass and soap, as a disinfectant, and as a cleansing agent. Common names of sodium carbonate are *sal soda* and *washing soda*. *Sodium bicarbonate* is the common *baking soda* or *saleratus* used with sour milk or cream of tartar to raise bread, biscuits, or pastry. It is also an ingredient of baking powder (which see). When heated or when mixed with an acid, sodium bicarbonate gives up carbon dioxide, and the escaping gas puffs up the dough. Sodium bicarbonate is used in medicinal preparations for the relief of acidity of the stomach, and is one of the two compounds that make up Seidlitz powders (which see). *Caustic soda*, known as *sodium hydroxide*, is used in making hard soap, paper, and dyestuffs, and in bleaching and kerosene-oil-refining. See **SODIUM**.

T.B.J.

Chemical Formulas. The formula for sodium carbonate is Na_2CO_3 ; that is, a molecule contains two

atoms of sodium (*natrum* in Latin), one atom of carbon, and three atoms of oxygen. Sodium bicarbonate is NaHCO_3 , its molecule containing one atom of sodium, one of hydrogen, one of carbon, and three atoms of oxygen. Sodium hydroxide is NaOH ; its molecule contains one atom of sodium and the hydroxyl group OH. The latter is an association of one atom each of oxygen and hydrogen, the atoms remaining together in chemical reactions.

SODA LYE. See **CAUSTIC**.

SODA WATER, a pleasant, effervescing, and highly popular drink made of water charged with carbon dioxide and flavored with syrups. The carbon dioxide is stored in steel cylinders under high pressure, and the water is in a strong steel or copper tank. When the liquid carbon dioxide is allowed to escape into the water, it instantly changes to gas, which is dissolved in the water until the required pressure is reached, when the process is stopped. The pressure in the tank forces the water into the pipes in a soda fountain, and when it is drawn, the rapid escape of the gas causes the water to effervesce (see **ABSORPTION**). Pop, ginger ale, and numerous other soft drinks consist of water flavored with a syrup and charged with carbon dioxide. The chief difference between them and soda water is that they are bottled when charged with the gas, while soda water is prepared by mixing the flavoring syrup and the water in the glass. There is no soda in soda water. It was so named because, formerly, bicarbonate of soda was used in preparing the carbon dioxide for charging the water.

Soda water was first used in Philadelphia in the early part of the nineteenth century. The soda fountain was exhibited at the Paris Exposition in 1867, but soda water was little known in England until about 1908, when an American, Harry G. Selfridge, established a great department store in London and invested a large sum in a modern soda fountain.

SODIUM, a silvery white metal that is soft as wax and lighter than water. Its symbol is *Na*, from *natrum*, the Latin name of the element. Sodium and potassium are sometimes called the "great twins of chemistry," because they have so many common characteristics. Both are alkali metals, their compounds with hydrogen and oxygen being strongly alkaline. Both are intensely active chemically, and when thrown upon hot water, they unite with oxygen so violently that hydrogen is liberated and sufficient heat generated by chemical action to set the hydrogen on fire; the presence of sodium vapor causes a yellow flame. The affinity of sodium for oxygen is so great that it has to be kept in kerosene or naphtha, liquids that do not contain this gas.

Sodium constitutes about 2.6 per cent of the earth's crust, as compared with 2.4 per

cent for potassium. Neither is found free in nature. Their compounds are so much alike in properties that a sodium compound can usually be substituted for a potassium compound in industrial processes, though the end products are different. Because sodium compounds are cheaper, they take precedence in industry. Potassium compounds find greater use in agriculture, as fertilizers.

Sodium exists in large quantities in common salt (sodium chloride), which is a compound of this element and chlorine. In 1791 Nicolas Le Blanc discovered a process of obtaining sodium carbonate (sodium, carbon, and oxygen) from common salt, and so made accessible that useful commodity known commonly as *soda*. The Le Blanc process consists in heating salt with sulphuric acid, in roasting the resulting sodium sulphate with powdered coal and limestone, and in separating the carbonate from the final compound by solution in water. This process has been largely replaced by the Solvay method, and by the still newer electrolytic process. In the Solvay process, sodium bicarbonate (baking soda) is manufactured by the interaction of strong ammonia-saturated salt brine with carbon-dioxide gas, forced in at the bottom. The bicarbonate is precipitated and freed by filtration, and sodium carbonate is produced by heating. In the electrolytic process, the salt molecule in brine is split into sodium and chlorine by means of an electric current.

Other Compounds. *Chile saltpeter*, or *sodium nitrate*, is a valuable fertilizer and the chief source of nitric acid. *Sodium sulphate* is used as a substitute for the carbonate in the manufacture of cheap glass. It is also a medicine under the name *Glauber's salt*. *Sodium sulphite* is a serviceable preservative and a source of sulphur dioxide. *Sodium thio-sulphate* is employed in fixing photographs, and *sodium cyanide* is valued in the extraction of gold from ore. The *fluoride* is an insecticide. The *bromide* and *iodide* are employed in nervous diseases. The *sulphide* finds a wide use in the manufacture of rayon. T.B.J.

Related Subjects. For further information regarding the compounds of sodium, and for supplementary facts, the reader is referred in these volumes to the following articles:

Alkali	Glauber's Salt
Chemistry	Potassium
Chlorine	Salt
Electrolysis	Saltpeter
Fertilizer	Soda

SODIUM BICARBONATE. See SODA.

SODIUM CARBONATE. See SODA.

SODIUM FLUORIDE, *floo' or ide.* See INSECTICIDES AND FUNGICIDES, subhead.

SODIUM HYDROXIDE, *hi drok' side.* See SODA; CAUSTIC.

SODIUM TETRABORATE, *tel ra bo' rate.* See BORAX.

SODOM, *sod' um*, one of the ancient cities of the plain north of the Dead Sea. It lay in a region described, in *Genesis* XIII, 10, as having been "as the garden of the Lord," till Sodom and Gomorrah, a neighboring city, were overthrown by God because of the extreme wickedness of their inhabitants. It was at the time of the destruction of Sodom that Lot escaped in safety, according to the Biblical account, while his wife, lingering on the way, was turned into a pillar of salt. The fate of Sodom and Gomorrah is repeatedly mentioned in the Bible; likewise that of Lot's wife. Jesus himself, when exhorting His disciples to steadfastness (*Luke* XVII, 32), used the admonition, "Remember Lot's wife."

SODOM, APPLE OF, a fruit said to be beautiful to the sight, but to fill the mouth with bitter ashes when tasted. In early literature, it is recorded as growing near the shores of the Dead Sea. By many it is considered to have been merely legendary, while others attempt to identify it with one or another of the plants now growing in that region. Some believe it to be a species of gall found on dwarf oaks (see GALLS).

Modern Application. From the above legend comes the term "ashes of Sodom," referring to disappointed hopes and bitter regrets over a seemingly attractive enterprise.

The only Bible passage that can be said to refer to this fruit is that found in *Deuteronomy* XXXII, 32:

For their vine is of the vine of Sodom,
And of the fields of Gomorrah:
Their grapes are grapes of gall,
Their clusters are bitter.

SOFIA, *saw' fe yah*, or *so fe' ah*, capital of Bulgaria (which see).

SOFT MONEY. See MONEY (Unusual Terms Applied to Money).

SOGDIANA, *sog dih a' nah.* See ALEXANDER THE GREAT.

SOIL. The greater part of the earth's surface is covered with a layer of loose particles, varying in depth from a few inches to several feet. This layer is called *soil*. To the geologist the entire layer is soil, but the agriculturist includes in his idea of soil only those portions that are suitable for the production of plants.

Formation of Soil. The processes that form soil have been in operation from the remotest geological ages, and they are still active. The chief agencies in its formation are the atmosphere, water, plants, and animals.

Work of the Atmosphere. Air is composed chiefly of nitrogen and oxygen, and oxygen is the most active chemical agent known. Under the influence of moisture, it attacks the rocks and causes them to decay and crumble; the fine particles formed in this way are added to the soil. Again, in dry regions high winds wear away the rock by driving against it particles of sand which they carry, and the particles thus

worn away are carried in the air until they fall to the earth and are added to the soil. The peculiar forms of rocks in the Bad Lands of South Dakota and other localities are fashioned by wind. In sandy regions, sand dunes or drifts are formed by the wind, and in other localities, fertile soil is often carried greater or less distances and added to the soil of the region where it falls.

Work of Water. Water is by far the most important agent in the formation of soil. Running water will wear the hardest rock, and since nearly all running water carries sand and gravel, these assist in wearing the rocks over which the stream flows. The particles worn off are carried downstream until deposited on its bed or banks, forming the great alluvial deposits which characterize the lower portions of the valleys of great rivers; these formations contain some of the most fertile soil in the world.

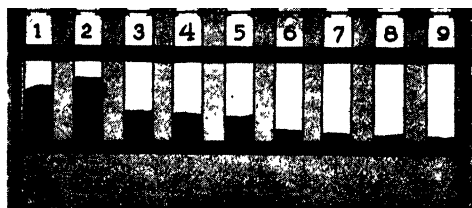
Rain and snow assist the atmosphere in breaking rocks into small fragments. When water freezes, the ice occupies more space than the water; we have seen pitchers broken by the freezing of the water in them. When water freezes in the crevice of a rock, it works in the same way and makes the crevice larger, so that, in the course of a number of years, the piece of rock is broken off. If we examine the base of any rocky cliff, we shall find an accumulation of pieces of various sizes, ranging from those weighing hundreds of pounds to tiny particles of soil. This mass of loose rock at the foot of a cliff is called *talus*. In addition to this, repeated freezing and thawing of water on the surface of rocks constantly wears them away, forming soil. This process is known as *weathering*. Water also acts chemically, since the oxygen in it attacks substances that have been dissolved from the rock.

In past geological ages, great glaciers covered most of the northern part of North America, and by their movement crushed and ground the rocks into soil, which they deposited where they melted. Much of the soil in Canada and in the United States north of the Ohio River and east of the Mississippi was formed by glaciers (see GLACIER).

Work of Plants. The roots of plants, the leaves of trees, and the stems of all plants that are allowed to stand and die down in the fall, decay and become a part of the soil. Moreover, the roots, by extracting certain plant food from rocks, help to break them up. Sometimes large rocks are split apart by the roots of trees. Certain minute plants, such as molds, grow on decaying plants and hasten the process of changing these plants to soil.

Work of Animals. Animal waste is constantly added to the soil, and sooner or later the animal dies and its body decays and becomes a part of the earth. Animals not only

add to the soil, but they are important agents in mixing the soil. Gophers burrow in the alfalfa field and damage the crop. Woodchucks burrow in the clover field and make mounds that are a hindrance to the farmer, and he attempts to destroy these and all other burrowing animals; yet in all ages these animals have performed an important part in making soil. But the small members of the animal kingdom, such animals as the earthworm and the ant, perform a work of far greater value. An au-



COMPOSITION OF LOAM
In 200 grams (about seven ounces) of loam the constituent parts are as follows:

- | | |
|-------------------------|----------------|
| 1. Organic matter—humus | 5. Fine sand |
| 2. Very fine sand | 6. Coarse sand |
| 3. Clay | 7. Medium sand |
| 4. Silt | 8. Gravel |
| | 9. Fine silt |

thority on agriculture says, "Each ant hill is a real soil-mixing mill."

Earthworms burrow in damp, rich soil and derive their nourishment from the animal and vegetable matter it may contain. In order to obtain their food, these worms eat the earth but reject the portion containing no nourishment. In passing the soil through their digestive system, the worms pulverize it and cast it forth in a highly fertile state. Darwin estimated that in England these worms brought to the surface more than ten tons of dry mold to the acre. Air enters the soil through the holes made by the worms, and aids in the decomposition of substances beneath the surface. See EARTHWORM.

Transportation of Soil. We often find the soil on one side of a hill or valley to be very different from that on the other. This is because the soil in one place has been brought there from some other locality, probably by water or ice, and that in the other place is still lying where it was formed. We have already seen that rivers carry soil to the lower part of their course. Rain washes the soil down the slopes of a hill and deposits it on the lowlands. Hence the soil is deeper on these lands than on the hillsides. As water carries the soil, it also sifts it. In the upper course of the stream, where the current is usually swift, all grades of soil, including coarse gravel, are swept along, but as we go downstream, the soil becomes finer and finer, until in the lower course only the finest silt is carried.

Kinds of Soil. Soil is classified according to its composition and according to its texture. Soil contains mineral (inorganic) and animal and vegetable (organic) matter. The minerals in soil are chiefly clay, sand, and lime, the last of which is in the form of pulverized limestone. The organic matter, consisting of decaying animal and vegetable substances, such as leaves, twigs, and the dead bodies of animals, is called *humus*. A clay soil is more than one-half clay; a sandy soil is at least one-half sand. A loam is a soil in which clay, sand, and humus are mixed in about equal proportions. Since humus is necessary to fertility, loams are the most desirable soils for agricultural purposes. Loams are classified as clayey, sandy, and silt, according to their composition. Each is specially fitted to certain crops.

According to texture, soils are coarse or fine. Fine soils are the more desirable for agriculture, because they contain a larger proportion of humus and also hold water better. Each particle of soil is surrounded by a thin film of water like that on a marble that has been wet. This is the water used by growing plants. Free water drowns the roots and prevents them from absorbing nourishment, so that plants die where there is too much water. Since clay holds water, a certain proportion of clay is necessary to fertility. Sandy soils are infertile, because they do not hold water, and because they usually lack the necessary proportion of humus. This may be supplied in a measure by fertilizers. C.F.C.

Related Subjects. The reader who is interested in a study of soils will find much that is of interest in these volumes in the following articles:

Agriculture	Loam
Clay	Loess
Drainage	Manures
Dry Farming	Marl
Erosion	Phosphates
Fertilizer	Rotation of Crops
Irrigation	Sand

SOIL, SCIENTIFIC MANAGEMENT OF THE. See AGRICULTURE, subhead.

SOILS, BUREAU OF. See AGRICULTURE, UNITED STATES DEPARTMENT OF.

SOL, the name of a proposed new month in the calendar year. See CALENDAR (Shall the Calendar Be Changed Again?).

SOL, *sohl*, a standard coin in Peru. See MONEY (Foreign Monetary Standards).

SOLANACEAE, *sol a na' se e*. See NIGHTSHADE.

SOLANO, *so lah' no*. See CALIFORNIA, page 1094.

SOLANUM, *so la' num*, the typical and most important genus of the nightshade family of plants. It includes herbs and shrubs of more than 500 species, especially abundant in tropical America. The most common and important species is the common *potato*, and another is the *eggplant*. Other well-known species of

temperate regions are the *bittersweet* and the common *nightshade*, which are widely distributed throughout America and Europe, and the *horse nettle* and other spiny, troublesome weeds native to the United States. Several species, long ago used as medicine, are still employed by the Chinese as medical remedies. The fruits of many East Indian varieties are eaten, and a species known as the *kangaroo apple* is a common food in Australia and New Zealand. B.M.D.

Related Subjects. The following members of the genus are treated in these volumes:

Bittersweet	Eggplant	Nightshade	Potato
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SOLAR DAY. See TIME.

SOLAR ENGINE, OR SUN MOTOR, a mechanical device for collecting heat from the sun and utilizing it as motive power. A solar motor erected at Pasadena, Calif., in 1901, was the most successful of these inventions, yet experiments were discontinued. It consisted of a huge mirror in the shape of an umbrella, thirty-six feet six inches in diameter at the widest end, tapering to fifteen feet at the bottom. The disk contained 1,788 small mirrors, so arranged that the sun's rays might be concentrated upon a boiler containing 100 gallons of water and space for eight cubic feet of steam. The boiler was connected with machinery that pumped water at the rate of 1,400 gallons per minute. By an automatic arrangement, as soon as steam was developed in the boiler, the mirror was connected with clockwork which caused it to turn with the sun in its course.

It was thought that the solar motor would lead to great development of arid lands by providing cheap means of running irrigation pumps, but little has been accomplished in that direction. All experiments have been interesting, but the practicability of such devices is questioned. One objection is that the motor cannot be made effective at night or on cloudy days.

SOLAR MICROSCOPE, an instrument for casting a magnified image of a small object upon a screen by means of sunlight or artificial illumination. It consists of a brass tube and a reflecting mirror, so adjusted that the rays of light are reflected into the tube. The object to be magnified is placed on a stage at the opposite end of the tube. The tube is attached to the inside of a closed window shutter, being placed over a hole. A double-convex lens collects, and brings to a focus on the object, the light rays, and, by means of a second lens, a magnified image of the object is projected on a white screen. Modern instruments usually make use of the electric arc or oxy-hydrogen limelight, instead of the sun's rays. The solar microscope is similar to a stereopticon (which see).

SOLARO, MOUNT. See CAPRI.

SOLAR PHOTOGRAPHY. See SUN.

SOLAR PLEXUS, *plek' sus*, a large nerve center situated in the abdominal cavity between the aorta and the stomach. It is a network of sympathetic nerve threads [see NERVOUS SYSTEM (Sympathetic System)], connected by numerous branches with the vital organs of the abdomen, and is sometimes called the *abdominal brain*. Because of this arrangement, the organs of digestion and elimination and the heart are all connected one with another, and what affects one may affect all. A pugilist knocked out by a blow on a certain spot on the abdomen has been hit on the solar plexus; the force of the blow causes paralysis of the plexus, and this in turn brings on unconsciousness. This spot lies between the navel and the end of the breastbone, a little to the right. K.A.E.

SOLAR SPECTRUM. See SPECTRUM ANALYSIS.

SOLAR SYSTEM. When you hear someone speak of the sun as "Old Sol," you gain the impression of a friendly relationship, as though the huge ball of fire in the skies were a man to whose faithful care we owe our light, our heat, and an even more valuable possession, the genial sunniness of heart which we feel on pleasant days. There are a great many members of "Old Sol's" family—the solar system, as it is scientifically called—for our own earth is but one of countless bodies that travel round and round him, receiving and reflecting his light and heat in greater or less quantities, according to their nearness to or distance from him. First of all, there are the nine large *planets*, of which our earth is fifth in size; next, there are the smaller *planetoids*, or *asteroids*, which are counted in hundreds; lastly, there are the myriads of *meteors*, which travel in swarms and are so small that they are not visible unless they come in contact with our atmosphere, whereupon they become incandescent and are seen as shooting stars. Besides all these, there are the *comets*—"visitors from space," one astronomer calls them—some of which are "transients."

None of the members of the solar system moves about the sun in an exact circle, though all have regular orbits. When the distance of any one from the sun is stated, its mean distance is meant. A peculiar thing about the distance of the larger bodies, first shown to the astronomical world in 1772 by a German named Bode, may be seen in the following table:

	TENS OF MILLIONS OF MILES FROM SUN	BODE'S NUMBERS
Mercury.....	3.59	4
Venus.....	6.72	7
Earth.....	9.29	10
Planetoid Eros.....	13.55	
Mars.....	14.15	16

Planetoid Ceres.....	25.70	28
Jupiter.....	48.33	52
Saturn.....	88.60	100
Uranus.....	178.19	196
Neptune.....	279.25	388

Unnamed planet, discovered in 1930.

Bode formed his series of numbers by adding 4 to each number in the series, 0, 3, 6, 12, 24, 48, 96. In his day, the planets and planetoids italicized in the above table were unknown, but it was seen that the distances of six known planets corresponded very closely to his numbers. In 1781 Uranus was discovered, and was found to correspond fairly well with another number in the table. Astronomers began to take more interest in Bode's Law, and their search for a planet to correspond to the missing number 28 resulted in the discovery of Ceres and other asteroids. Whether or not the law represents a true law of the universe, scientists do not yet know. F.B.L.

Related Subjects. More about the solar system will be found under ASTRONOMY, and certain theories as to its origin in the article NEBULAR HYPOTHESIS. The reader may also consult the following articles:

Asteroids	Meteors
Comet	Planet (with list)
Copernicus	Satellite
Gravitation	Sun

SOLDERS, *sod' urz*, alloys used to join surfaces or edges of certain metals, by fusion at the point of contact. To be effective, a solder must melt more easily than the metal to which it is applied. Solders may be either hard or soft. Hard varieties are usually prepared by combining, in each case, the metal to be soldered with some others. Solder for gold, for example, is prepared from gold and silver, or from gold and copper, or from a mixture of the three metals. Silver solder consists of equal parts of silver and brass, with the addition of a little zinc. Soft varieties are prepared from varying proportions of tin and lead, bismuth being sometimes added. Hard solders can be drawn out into threads and hammered into sheets. That is, they are both ductile and malleable. Soft solders melt the more easily, but are too brittle to bear hammering. Before surfaces are soldered, they must be bright and clean and free from oxide.

SOLDIERS' BONUS. Every enlisted person below specified rank who served in the World War under the flag of the United States was granted a bonus in May, 1924, for service rendered to his country, in addition to the regular pay provided while in uniform. The country deemed inadequate the regular pay allotted soldiers in the world's greatest war. The bonus law applied to all men up to and including the rank of captain in the navy, colonel in the army, first lieutenant or first lieutenant of engineers in the Coast Guard, and passed assistant surgeon in the Public Health Service. In the phraseology of the statute,

the bonus was termed "adjusted compensation," or "adjusted service credit." It took the form of a cash payment to each person whose allotment was \$50 or less, and an insurance policy in each case where the adjusted credit exceeded that sum. In cases where death had intervened, the beneficiaries' families received cash payments.

The adjusted compensation was figured on the basis of \$1 per day for service at home and \$1.25 per day for overseas detail for the period of active service in excess of sixty days, up to a maximum of 500 days in any case. The sixty-day exception was made, because upon discharge each soldier was given \$60, in addition to his regular compensation.

The insurance took the form of a twenty-year endowment policy, the amount of each policy being determined by a somewhat intricate table of factors based on length of service. As an example of the benefits conferred, a man who was 180 days in home service and 100 days in Europe received a policy with face value of \$615. See PENSION.

SOLDIERS' HOMES, homes maintained by a government for disabled or aged soldiers. These afford provision for the comfort and well-being of soldiers who have lost their health in the country's service, or are not able to support themselves. Candidates for entrance into homes must be provided with an honorable discharge from military service. Inmates are subject to the Articles of War, as if still serving in the army. A pensioner on entering a home may assign his pension to any member of his family, or part of the pension may be drawn, the remainder being kept in trust for him.

The first soldiers' home was founded in the District of Columbia, by act of Congress, in 1851. This home is for soldiers of the regular army only. National homes for volunteer soldiers, supported by the Federal government, are situated in the following cities:

Dayton, O.	Leavenworth, Kan.
Milwaukee, Wis.	Santa Monica, Calif.
Togus, Me.	Marion, Ind.
Danville, Ill.	Johnson City, Tenn.
Hampton, Va.	Hot Springs, S. D.

State homes for soldiers of the volunteer armies, to which the Federal government contributes \$100 per year for each inmate, are in the cities named below:

Yountville, Calif.	Minneapolis, Minn.
Monte Vista, Colo.	Saint James, Mo.
Noroton Heights, Conn.	Columbus Falls, Mont.
Boise, Ida.	Burkett and Milford,
Quincy, Ill.	Neb.
Lafayette, Ind.	Tilton, N. H.
Marshalltown, Ia.	Kearny and Vineland,
Fort Dodge, Kan.	N. J.
Chelsea, Mass.	Bath and Oxford, N. Y.
Grand Rapids, Mich.	Lisbon, N. D.

Sandusky and Madison,
Ohio
Oklahoma City, Okla.
Roseburg, Ore.
Erie, Pa.
Bristol, R. I.

Hot Springs, S. D.
Bennington, Vt.
Orting and Retail,
Wash.
Waupaca, Wis.
Buffalo, Wyo.

Confederate Soldiers' Home. In 1902 Beauvoir, near Biloxi, Miss., the last residence of Jefferson Davis, was secured as a home for aged Confederate army veterans. It is supported by the United Sons of Confederate Veterans, the United Daughters of the Confederacy, and by the state of Mississippi, through appropriations made by the legislature.

SOLDO, *saw'l' doh*, a standard coin in Italy. See MONEY (Foreign Monetary Standards).

SOLE, a family of flatfish having the characteristic twisted cranium and both eyes on the right side of the body (see FLATFISH). The eyes are small and set close together, the mouth is crooked, and the body a flattened oval, something like the sole of the human foot in shape. These fish are found in warm seas near shore. The common American sole, known locally as the *hogchoker*, inhabits the eastern coast seas of North America. It has a brownish body marked with black bands. This sole feeds on vegetable debris and is worthless as a food fish. The European species is much prized, because its flesh is firm and white and of good flavor. The European sole grows from ten to twenty inches in length, and averages about a pound in weight. Species of flounder that inhabit coast waters are also known as soles. See FLOUNDER. L.H.

Scientific Names. The American sole is *Achirus fasciatus*. The European is *Solea vulgaris*.

SOLEDAD. See CALIFORNIA, page 1094.

SOLEMN LEAGUE AND COVENANT. See COVENANTERS.

SOLICITOR OF THE TREASURY. See TREASURY DEPARTMENT.

SOLID, a term used in mathematics to define a geometric figure with the three dimensions of length, breadth, and thickness. Any particular solid takes its name from the shape of its bounding surfaces, as cube, sphere, etc.

In physics, a body is said to be *solid*, *liquid*, or *gaseous* according to the power of its molecules to resist forces tending to change its shape (see LIQUID; GAS). J.W.Y.

Related Subjects. The following articles in these volumes discuss various mathematical solids or present important phases of this subject:

Cone	Mensuration
Cube	Prism
Cubic Measure	Pyramid
Cylinder	Sphere
Geometry	Spheroid

SOLIDS. See MOLECULE (Molecular Force).

SOLIS, *so lees'*, DIAZ DE. See RIO DE LA PLATA; URUGUAY.



THE KINGDOM OF SOLOMON

The dotted line farthest east in the first map represents approximately the eastern boundary of the territory directly influenced by Solomon's reign. The map at the right shows the division of the kingdom after his death.

SOLITAIRE, *sol ih tair'*, the collective name of many games of cards to be played by one person. The object of the games in practically all variations is to arrange the cards in suits, and build up or down in regular sequence, while following certain rules. The player's interest lies in the extent of his success in working out the various combinations. Under the name of *patience*, these games have been known and played for centuries, though few ancient writers give details of the various plays. In some variations of solitaire, the exercise of skill and judgment is necessary, but in most they depend entirely on the element of luck. A great number of solitaire games are described in manuals of card games.

SOLOGUB, *sol' o goop*, FEODOR. See RUSSIAN LITERATURE.

SOLOMON, the third king of Israel and the wisest man of his age, was the son of David and Bathsheba. His reign extended from about 993 to 953 B.C. He was born in Jerusalem, but nothing is known about his boyhood. Many suppose that the prophet Nathan was his teacher. However this may be, the knowledge and ability which he showed when he

became king would lead to the belief that he had received the best training possible for the high office he was to fill.

When King David was about to die, Solomon's brother Adonijah attempted to make himself king; but David had promised Bathsheba that Solomon should succeed him as king, so Bathsheba and Nathan told David of Adonijah's attempt. David then told Nathan to have Solomon ride to Gibeon, and there be anointed king by Zadok, the priest. When this was done, Adonijah and his followers feared for their lives, and "each man went his own way," leaving Solomon in peaceful possession of the kingdom; but, according to the custom of his time, Solomon caused the leading men who had opposed him to be slain, one by one.

Solomon's Dream. Solomon is supposed to have been about twenty years of age when he became king. He was a zealous worshiper of Jehovah, and began his duties by offering sacrifices and giving God thanks for the great favors conferred upon him. In the night, God appeared to Solomon in a dream and said, "Ask what I shall give thee"; and Solomon said:



Photo: Visual Education Service. From the painting by Rubens

THE QUEEN OF SHEBA VISITS KING SOLOMON
[See *I Kings* x, 1-13.]

O, Lord, my God, thou hast made thy servant King instead of David, my father: and I am but a little child; I know not how to go out or come in. And thy servant is in the midst of thy people which thou hast chosen, a great people, that cannot be numbered nor counted for multitude. Give thy servant therefore an understanding heart to judge thy people, that I may discern between good and evil, for who is able to judge this, thy great people?

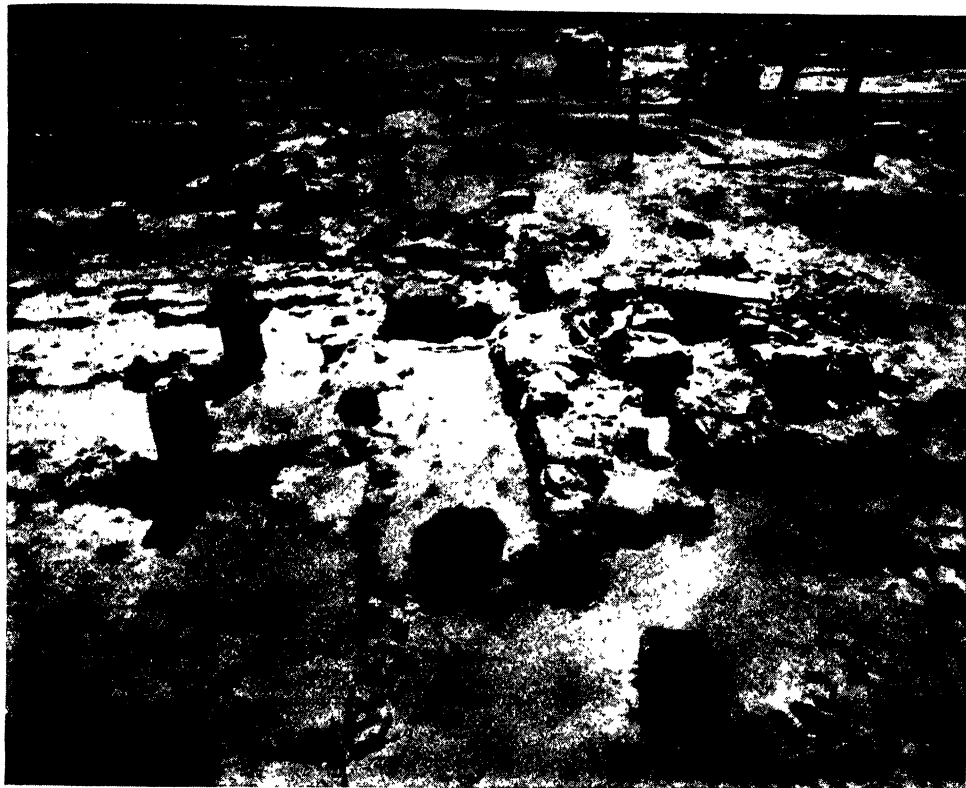
The record states that "the speech pleased the Lord," and Solomon was promised not only wisdom, but also wealth and honor. The promise was literally fulfilled, for Solomon was recognized as the wisest and wealthiest king of his age.

Building the Temple and Palace. According to the account in *I Chronicles*, David, before his death, gave Solomon the plans and full directions for building the Temple, for which he had gathered together most of the material. Solomon formed an alliance with Hiram, king of Tyre, by whom he was furnished with skilled workmen and cedar. The structure was begun in the fourth year of his reign, and seven years were required for its completion. Though small and plain compared with many of the cathedrals of modern times, the Temple was considered to be one of the most wonderful buildings of its time. Its completion established Jerusalem as the center of worship for the nation, as well as the center of government.

Solomon also built for himself a palace upon grounds adjoining those of the Temple. This required thirteen years for its completion, and it was not finished until the twentieth year of his reign.

Extending Commerce. Solomon placed fleets of ships on the Red Sea and on the Mediterranean. These vessels were manned by Phoenician sailors, because the Israelites were not acquainted with the art of navigation. The fleets of Solomon are supposed to have sailed southward as far as the southern part of Africa, and westward as far as Spain. Some authorities believe that they sailed eastward as far as India, but there is no positive information concerning the extent of any of these voyages. We do know, however, that Solomon extended the commerce of his kingdom to all surrounding nations, and that his ships, for that age, made long voyages. As a result of his trade with so many peoples, he gained great wealth, which he expended in maintaining his army and court.

The Splendor of the King. Soon after he became king, Solomon made an alliance with Pharaoh, king of Egypt, and married his daughter, bringing her to Jerusalem. His palace was one of the most magnificent structures of the time. His throne was of ivory covered with gold. All the kingdoms over which he ruled



THE STABLES OF SOLOMON UNCOVERED

In the Bible (*I Kings* x, 26) is a record of the chariots and horsemen of this great king. In 1928 an expedition led by scientists of the University of Chicago, engaged in the work of excavation in Armageddon in Palestine, discovered the remains of the stables of Solomon. They were laid out very systematically. In a report, it is stated that the stalls, of huge, hollowed stone blocks, are arranged in double rows. The horses, about twelve to a row, stood facing each other, with a passage between the two rows of heads for the grooms and keepers to feed and control them. In front of each horse was its manger, and the rows of mangers were divided by massive stone hitching posts, which still contain the original tie holes for the insertion of halter ropes.

"brought presents and served Solomon all the days of his life." "And the king made silver to be in Jerusalem as stones, and cedars made he to be as sycamore trees that are in the lowland, for abundance." We read also that he had 40,000 stalls of horses for his chariots and 12,000 horsemen. In addition to these, were several hundred officials of state and attendants who were maintained in and about his palace.

Solomon's Wisdom. Solomon was more than a judge and lawgiver to his people. He studied into the secrets of nature and learned many facts that previous to his time had not been observed. From the proverbs which he spoke, we know that he had a good knowledge of plants and animals; also, that he was a student of human nature. His proverbs are guides to life, and for three thousand years they have influenced men. The Bible tells us that "he spoke three thousand proverbs, and his songs were a thousand and five." Nevertheless,

The Song of Solomon and the proverbs found in the book of *Proverbs* are all that remain of his sayings and writings, but these are enough to place him among the wisest of men. After communing with him, the Queen of Sheba, who visited him with all the pomp and splendor of an Eastern monarch, exclaimed, "The half was not told me; thy wisdom and prosperity exceedeth the fame which I heard. Happy are thy men, happy are these thy servants, which stand continually before thee, and that hear thy wisdom."

His Decline. Contrary to the Hebrew ideals, Solomon established a harem, and made alliances with women of the surrounding heathen nations. In time, to appease these women, he erected altars to their gods in and about Jerusalem. This weakened his influence over the Israelites, and caused dissension in his court. Moreover, the extravagance of the court caused a heavy burden of taxation, under which the people had become restive; thus, during the last

years of his reign, the seeds of dissension, which bore fruit in the division of the kingdom soon after his death, were gradually sown. He reigned forty years, and was succeeded by his son Rehoboam.

Estimate of His Character. In his temperament and tastes, Solomon was the opposite of his father David. He preferred the pursuits of peace to those of war, and under him the Hebrew nation enjoyed a longer period of universal peace and prosperity than at any other time in its history. An eminent authority, Richard G. Moulton, aptly characterized these two great kings:

What David achieves, Solomon carries further. If David founded a kingdom, Solomon extended this to an empire. If David had the honor of ordering the service of Jehovah, it was reserved for his son to lay the art and riches of Tyre under contribution to crown the Divine service with the Temple. David is the center of Hebrew poetry; Solomon is the founder of its wisdom.

Derivation. Solomon's name means *peaceful*, and it was given him because of a prophecy which foretold his birth: "His name shall be Solomon, and I will give peace and quietness unto Israel in his days" (*I Chronicles* XXII, 9). The story of Solomon is found in *I Kings*, I-XI, and in *II Chronicles*, I-IX.

Related Subjects. The reader is referred in these volumes to the following articles:

David	Phoenicia	Solomon's Song
Jerusalem	Proverbs	Temple

SOLOMON ISLANDS. See PACIFIC ISLANDS.

SOLOMON'S SONG, SONG OF SONGS, OR CANTICLES, one of the books of the Old Testament, a dramatic poem written in celebration of wedded love. In its present form, the original assignment of parts to characters is difficult to restore. There are two current interpretations. In the first of these, King Solomon, disguised as a shepherd, woos a country maiden and takes her finally to his court, where they are married in great splendor, returning afterward to her rural home for a honeymoon. In the second, the maiden, though surrounded by all the allurements of king and court, remains true to an actual shepherd lover, to whom she at last returns. The culmination of either plot is found in the lines (VIII, 6-7):

For love is strong as death;
Jealousy is cruel as the grave.

Many waters cannot quench love,
Neither can the floods drown it.

In Jewish theology, *Solomon's Song* is considered as an allegory, picturing the close relationship between God and Israel. Christian commentators regard it as symbolizing the union of Christ and the Church. See SOLOMON.

SOLOM, so' lun (about 639-559 B.C.), an Athenian statesman, one of the most famous lawgivers of all time, who will always be re-

membered as one of the "seven wise men of Greece." He was by class a noble, and was well educated, but was obliged to support himself by commercial ventures. His first public service consisted in an appeal to the Athenians, which led to the regaining of the island of Salamis, long in foreign hands. About 594 B.C., he was elected archon, and promptly instituted legal and governmental measures which have made his name famous.

Political and economic reforms were sadly needed in Athens. Most of the money had accumulated in the hands of a comparative few; living was high, and the small farmers had been compelled in many instances to mortgage their land, while the free laborers had sold themselves into slavery in order to live. By a sweeping ordinance, Solon annulled all these debts and mortgages, and provided that, in the future, no man should pledge his own person as security in borrowing money. He changed the system of coinage in such a way as to give immediate relief to many, and forbade the exportation of most articles.

His constitutional reforms consisted in a re-division of citizens into four classes, according to income, members of all classes to hold membership in the assembly and in the public law courts. In that offices were open only to members of the three higher classes, and the archonship only to the highest class, the reforms of Solon left the constitution of Athens oligarchic, but the granting of legal privileges to every citizen was a step toward democracy.

According to tradition, Solon pledged the Athenians to keep his laws for ten years, and left the state for that length of time. Civil strife broke out almost immediately, however, and before the death of Solon, Athens had come under control of the tyrant Pisistratus.

Related Subjects. The reader is referred in these volumes to the following articles:

Archon	Pisistratus
Oligarchy	Seven Wise Men

SOL STATE. See COLLOIDS.

SOLSTICE, *sol' stis*, a term used in astronomy to describe the point in the ecliptic at the greatest distance from the equator, either north in summer or south in winter. The word is derived from the Latin *solstitium*, meaning a *standing still of the sun*. In the spring, the sun crosses the equator about March 20, the vernal equinox; continuing its northward journey, it reaches the farthest point north about June 21, the summer solstice. The sun apparently stands still, or holds the same position for several days, before starting southward. Crossing the equator again about September 23, it reaches the southern winter solstice about December 22. In the northern hemisphere, June 21 has the longest and December 22 the shortest period of *daylight* in the year. F.B.L.

Related Subjects. The reader is referred in these volumes to the following articles:

Ecliptic Equator	Equinox Seasons	Sun Tropics
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SOLUTION, *so lu' shun*. When the particles of a solid, such as sugar, or of a gas, as carbon dioxide, or of a liquid, as alcohol, mingle with the particles of a fluid so completely that a uniform liquid results, a *solution* is formed. The fluid in which the substance is dissolved is called the *solvent*; the substance dissolved is the *solute*. The resulting liquid is not an example of chemical, but physical, change, for a new chemical compound is not formed. In case of a sugar solution, for example, the substance may be reconverted into sugar by evaporating the water. When any solvent has dissolved as much of a given substance as it can, the solution is said to be *saturated*. At the same time, it may not be saturated with respect to another substance, for a saturated salt solution will dissolve sugar crystals. When a solid changes to a liquid form, heat is absorbed, and it is on this principle that freezing mixtures are based. When pounded ice and salt are mixed together and packed about an ice-cream receptacle, they change to liquid form, and in so doing absorb heat from the contents of the can.

At a given temperature, the solubility of a particular solid in a given liquid never varies, but its solubility varies with different solvents. At ordinary temperatures, table salt dissolves about three times as freely in water as in alcohol; grease cannot be dissolved in water, but it can be in gasoline. Some very hard substances are slightly soluble. Flint glass, for example, used in making cut-glass utensils, dissolves somewhat in aqua ammonia. For this reason, the housewife should never clean her cut glass in water containing ammonia. When a gas dissolves in a liquid, there is a release of heat and a rise of temperature. See, also, COLLOIDS.

A.L.F.

SOLWAY FIRTH, an inlet of the Irish Sea, between Scotland and Cumberland County, England. It is about thirty-five miles long, and its width increases irregularly till it reaches twenty miles. Solway Firth is particularly noted for its spring tide, which drives in as a tidal bore six feet high at the rate of ten miles an hour. The waters are shallow and stocked with fish, particularly salmon.

SOLYMAN II, OR SULEIMAN (1494-1566), a sultan of Turkey, known as SOLYMAN THE MAGNIFICENT, under whom the Turkish Empire reached the height of its power. The country at his accession was prosperous, the army and the provinces were in excellent shape, and Solyman showed himself well able to make the best of these advantages. In his own country, he is known as the lawgiver, for he did much to improve the administration of

law and, incidentally, to better the condition of his Christian subjects; but it is chiefly for his conquests that he is remembered in European history.

He captured Belgrade and pressed on into Hungary, winning in 1526 a famous victory at Mohács. Twice he threatened Vienna, and though compelled to retreat, could never be forced to give up his hold on Hungary. He took Rhodes from the Knights of Malta, partially subjugated Persia, and showed his ambition to take part in European political affairs by making a treaty of alliance with Francis I of France. Literature had the benefit of his encouragement, and he proved himself generally an enlightened ruler. See TURKEY (History).

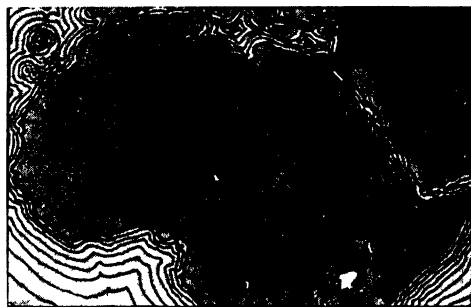
SOLYMAN THE MAGNIFICENT. See SOLYMAN II.

SOMA, *so' mah*, CELLS. See HEREDITY (The Physical Basis of Heredity).

SOMALI, *so mah' le*, COAST, the part of Somaliland (see below) which is French territory.

SOMALILAND, *so mah' le land*, OR **SOMALI**, *so mah' le*, a region in the eastern part of Africa, consisting of English, French, and Italian dependencies. Somaliland forms the peninsula which lies between the Gulf of Aden and the Indian Ocean.

French Somaliland, known officially as the *Somali Coast*, lies to the north, at the head of the Gulf of Aden, between Somaliland Protectorate (British) and Eritrea. It has an



SOMALILAND

(F) French; (B) British; (I) Italian.

area of 5,790 square miles, and a population estimated in 1928 at 85,778. There are several ports, the chief of which is Jibuti (Djibouti), with a population of 9,414 in 1928. This town is the seat of government of the colony, and is connected with Ethiopia (Abyssinia) by a railway. Somali Coast is not well developed industrially, but there is a considerable export trade in coffee, hides, skins, gold, and ivory. Overseas trade is chiefly with France and Great Britain. The country is hilly along the coast, but the interior is an elevated plateau.

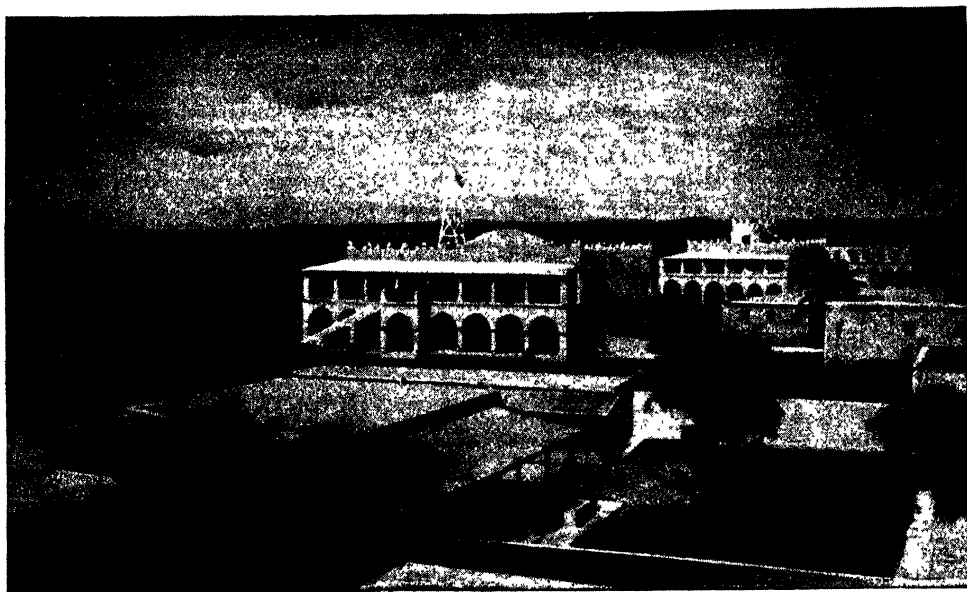


Photo: London News Agency

THE PORT OF KISMAYU

To past generations Africa was described as the "Dark Continent." There is nothing in this Italian port to justify the term. Except in the vast interior, there is everywhere evidence of the culture of the white race.

British Somaliland is known officially as *Somaliland Protectorate*. It borders on the Gulf of Aden, and on the west side adjoins Somali Coast, Abyssinia, and Italian Somaliland. The protectorate is about 68,000 square miles in area, and has a population estimated to be about 345,000. Nearly all of the natives are Mohammedans, and, with the exception of those who dwell in the coast towns, they are wandering herdsmen. Berbera, the largest town and the seat of government, has between 15,000 and 30,000 inhabitants, the number increasing during the trading season. Hargeisa (20,000) is the second largest city. Exports include skins, cattle and sheep, gum and resins, ostrich feathers, and ivory. The region is for the most part a sandy plain, with occasional mountains of granite and basalt.

Italian Somaliland is a long, narrow strip of country extending along the Indian Ocean from British Somaliland to Dik's Head in Kenya Colony, having been enlarged after the World War through treaty arrangements with Great Britain, in 1924. The dependency is called officially the *Colony and Protectorates of Italian Somaliland*. The area was increased to 190,000 square miles, approximately. The population is estimated to be 1,000,000, of whom about 1,000 are Italians. Along the coast the land is flat, but the inland regions are hilly. Hides and skins are exported in large quantities, and livestock, cotton, amber, iron, copper, myrrh, tobacco, grains, and gums are also shipped. The chief occupations of the

people are agriculture and stock-raising. Mogadiscio, Obbia, and Kismayu are the chief ports. The region has few forests, and is for the most part arid. See **PROTECTORATE**.

SOMERVILLE, MASS., a residential city of Middlesex County, in the eastern part of the state, about two miles northwest of Boston and close to Medford and Cambridge. The city is built on a series of hills on the Mystic River, here crossed by two bridges. From many of its eminences, beautiful views of the city of Boston are obtained. Somerville is identified with the activities of the early patriots in the Revolutionary War, and there are many historic places. Population, 1928, 102,700 (Federal estimate).

The city occupies an area of about four square miles, but is compactly settled. There is a large park area, and a number of boulevards lead directly to the Metropolitan reservations of Middlesex Fells, Mystic Lake, and Revere Beach. Paul Revere, on his famous ride in 1775, passed through the city over the street now known as Broadway.

Transportation. The Boston & Maine Railroad serves the city, and numerous electric-car lines connect with Boston and its many suburbs. There are also numerous motorbus lines.

Industries. Somerville has two miles of frontage on the Mystic River, which increases its value for industrial purposes. There are about 150 industrial establishments, including slaughtering and meat-packing plants, lumber and planing mills, manufacturing of furniture, paper and paper boxes, bakery

products, and jewelry, a Ford assembling plant, woolen mills, and a brass foundry.

Institutions and Historic Places. Among the prominent modern features of the city are the state armory, city hall, hospitals, and home for the aged. On Powder House Hill, in Tufts Park, is the old stone powder house where, on September 1, 1774, General Gage seized a quantity of gunpowder stored in anticipation of an outbreak of hostilities. On Prospect Hill, Israel Putnam raised the "Appeal to Heaven" flag on July 18, 1775.

History. Originally, Somerville was a part of Charlestown, and was settled in 1630. A year later, 600 acres known as "the Ten Hills Farm" were granted to John Winthrop, who built and launched there, on the shores of the Mystic, the *Blessing of the Bay*, the first ship built in New England. Somerville was separately incorporated in 1842 under its present name. A city charter was granted in 1872.

SOMMA, MOUNT. See **VESUVIUS**.

SOMME, *somm*, RIVER, a stream in the northern part of France, in the vicinity of which was fought, during the World War, one of the greatest battles of all time. The Somme rises in the department of Aisne, and follows a general westerly course of 140 miles to its estuary on the English Channel. Through this estuary ocean steamers enter the port of Saint Valery. A canal runs parallel with the Somme from Saint Valery past Amiens to Saint Quentin, and from that point there is communication by canal with the Oise and the Scheldt.

Battle of the Somme. This engagement represented the great Anglo-French offensive against the Germans during the summer of 1916. The British forces occupied the front to the north of the river, while the French held a mile of the front on the northern bank, and a ten-mile front south of the river. The first infantry charge was made on the morning of July 1, but this drive had been preceded by an intense artillery bombardment of the enemy's intrenchments and fortifications. After two weeks of furious fighting, the British had advanced three miles on a ten-mile front and had captured 10,000 prisoners; the French, in the same period, had advanced their line six miles and had captured 12,235 men. Then followed furious German counter-attacks, but, by the first of August, twenty-four square miles of territory had been conquered by the British.

Through August there was a lull in the fighting, during which preparations were made for a renewal of the drive. The second offensive began on September 3 and continued without abatement until interrupted by heavy rainstorms. The Allies made their last attacks in November. It was during the second phase of the drive that the British first used "tanks."

In summing up the results of the Battle of the Somme, General Haig, commander in chief of the British forces, claimed that it was a success, because (1) it had drawn the enemy from Verdun; (2) it had held large forces of Germans on the western front and enabled Russia to win a victory in the east; (3) it had inflicted heavy losses on the German army. In all, 120 square miles of territory were conquered

by the Allies. Statements of the losses on both sides were conflicting, but a fairly accurate estimate gave the allied loss as 675,000, and the German as high as 700,000 in killed, wounded, and prisoners. See **WORLD WAR**.

SOMNAMBULISM, *som nam' bu liz'm*, OR **SLEEPWALKING**, a curious condition in which a sleeper acts his dreams. Everybody dreams occasionally during sleep, and a great many people talk aloud in their dreams, but the person who translates his dreams into motion is comparatively rare. There are, of course, many degrees of such activity, from simply getting out of bed and walking about to performing complicated and difficult muscular feats. Tests have been made which prove that, as a rule, a somnambulist cannot hear ordinary sounds; that, whether his eyes are closed, or half closed, or wide open, he does not see; that he can neither taste nor smell. But he is usually endowed with marvelous muscular control. Sleepwalkers have been known to write letters, to paint pictures, or to perform other familiar tasks; they have also been known to climb steep roofs and to walk along the ridges, to follow narrow and dangerous paths, and to accomplish other feats which they could not perform if they were conscious. When a somnambulist awakes, if he remembers anything at all, he remembers it merely as a dream.

From the standpoint of psychology, somnambulism is an example of dissociation, or division of attention, in which the sleeper is attentive to but one line of action, and is directed by the subconscious mind. It may be considered an exaggerated form of absent-mindedness. The hypnotic state is a condition of somnambulism produced by suggestion. Sleepwalking occurs usually in highly nervous persons, and the cure depends on removing the cause. General care of the health and avoidance of strain and excitement will help many cases. See **SUBCONSCIOUS**. W.A.E.

SOMNUS, in Greek mythology, the god of sleep, and the son of Erebus and Nox, the goddess of night. He dwelt in a great cave in a remote and quiet valley, with his brother Mors, the god of death. Shadowy forms kept watch about the mouth of the cave, and shook great bunches of poppies, while they enjoined silence upon all who came near. In one of the darkened inner rooms of the cave, drowsy Somnus lay upon his couch, clothed in black garments studded with stars. On his head was a crown of poppies, and in his hand a goblet of poppy juice. Morpheus, his prime minister, supported his head and protected him during his slumbers. Pleasant Dreams hovered about his couch, and hideous Nightmares lurked in the darkened corners. Sometimes the Dreams were sent out of this valley, by way of glittering ivory gates, to the earth,

where they warned mortals of coming misfortunes. See MORPHEUS.

Modern Application. The word *somnolent*, meaning *drowsy* or *sleepy*, finds its derivation in the name of this god of ancient mythology. To "be in the arms of Morpheus" implies deep sleep, induced by a narcotic sprinkled upon the face by the minister of Somnus.

SONATA, *so nah' tah*, an instrumental composition consisting of three or four movements played in different rhythms, but related in thought. The typical four-part sonata begins with a brilliant allegro, then passes to a movement that is slow of rhythm and lyrical in character. The third movement is light and graceful, and may be a minuet or scherzo; the fourth is a brilliant finale. The first movement of a sonata has a definite form called *sonata-allegro* form. It consists of three sections—the *exposition*, the *development*, and the *repetition*. The modern sonata is the result of a gradual development in which various composers had a part. It was brought to its highest degree of perfection by Beethoven. A sonata written for the orchestra is called a *symphony* (which see). See, also, MUSIC.

SONG OF DEBORAH. See DEBORAH; JUDGES, BOOK OF.

SONG OF SONGS. See SOLOMON'S SONG.

SONG OF THE LARK. See BRETON, JULES ADOLPHE.

SONNET, *sahn' et*, a type of poem which is limited to fourteen lines, rhymed according to a definite scheme. It is a form of lyric poetry (which see). This verse form originated in Italy, and was given its classic form by Petrarch. He arranged the lines of a sonnet in two groups, an eight-line group known as the *octave*, and a six-line group known as the *sestet*. There are but two rhymes in the octave, the usual arrangement being *abba, abba*, while the *sestet* may have either two or three rhymes, which may be placed according to various schemes. The commonest form is *cde, cde*. The *sestet* may not, however, be broken into couplets.

The sonnet was introduced into England, about the middle of the sixteenth century, by the Earl of Surrey, and was immensely popular with the writers of the Elizabethan Age, Spenser and Shakespeare having each produced numerous examples. They varied the rhyme scheme, however, from the Petrarchan original, and Shakespeare's method has been adopted by many of his successors. Instead of two quatrains and a *sestet*, he made of the sonnet three quatrains and a couplet, rhymed usually *abab, cdcd, efef, gg*.

As it is so brief, the sonnet must be limited to one idea or emotion. Among the Romance peoples, any type of subject, light or serious, may be treated in a sonnet; in English sonnets, usually none but the graver thoughts and

sentiments find place. The very greatest of English poets have particularly delighted in this form of poem, seeming to realize that by its means they could attain a gemlike perfection impossible otherwise; and Shakespeare, Milton, Wordsworth, and Keats are the great names in the history of the sonnet in England. Mrs. Browning's *Sonnets from the Portuguese* have a high place among love poems, and many of Rossetti's sonnets are exquisite. Perhaps the best-known sonnet in English is Milton's *On His Own Blindness*; it is given below, both for its own worth and to show the construction of a sonnet:

When I consider how my light is spent
Ere half my days, in this dark world and wide,
And that one talent which is death to hide
Lodged with me useless, though my soul more bent
To serve therewith my Maker, and present
My true account, lest he, returning, chide;
"Doth God exact day-labor, light denied?"
I fondly ask. But Patience, to prevent
That murmur, soon replies, "God doth not need
Either man's work, or his own gifts. Who best
Bear his mild yoke, they serve him best. His state
Is kingly; thousands at his bidding speed,
And post o'er land and ocean without rest;
They also serve who only stand and wait."

SONS OF LIBERTY, the name adopted by an organization among the American colonists which actively opposed the Stamp Act (which see). It was not a single society with central control, but a group of patriotic associations which sprang up simultaneously in the various colonies, those of New York and Connecticut becoming strongest. Through committees of correspondence, the work of the different societies was coordinated. The chief mission of the Sons of Liberty was accomplished when the Stamp Act was repealed, in 1766, but they still opposed the importation of goods from England, and later favored independence.

Originally, they were of necessity secret societies, but later worked openly and had to do with many of the early movements toward separation, such as the calling of the Continental Congress. See REVOLUTIONARY WAR (Causes).

SONS OF SAINT GEORGE. See GEORGE, SAINT.

SONS OF VETERANS, an American patriotic society, organized on September 29, 1879, in Philadelphia, Pa., for a purpose similar to that of the Grand Army of the Republic (which see). The society is composed of lineal male descendants, over eighteen years of age, of honorably discharged soldiers, sailors, or marines who served in the War of Secession. The insignia of the society consist of a bronze bar, inscribed with the words *Filii Veteranorum*, with a pendant of red, white, and blue ribbon, attached to a medallion with the letters "S.V."

The Daughters of Veterans is a similar organization admitting women.

SOO CANALS. See SAULT SAINTE MARIE CANALS.

SOOT, a fine black substance deposited by smoke. It results from the imperfect combustion of fuel, such as wood, coal, or oil, and contains much carbon and ammonium salts. The large amount of nitrogen in the latter makes soot an excellent fertilizer, especially for cereals, grasses, and carrots. The soot nearest the fire is often a shining brown powder containing dried tar; it is used as a pigment under the name of *bister*. The blacker soot farther up the chimney, especially that from oil or resin, is the pigment *lampblack*. Soot adheres to anything with which it comes in contact; hence smoke blowing through a city deposits its soot upon the buildings in its path and makes them dingy. In London (which see) the damage from soot is estimated at several million dollars a year. In the worst cases, about three per cent of the coal burned is converted into soot. See COMBUSTION; SMOKE. T.B.J.

SOPHIA, *so fi' ah*, former Queen of Greece. See CONSTANTINE.

SOPHISTS, *sof' ists*, meaning *men of wisdom*, was the name given to wandering instructors in Greece in the fifth and fourth centuries B.C., previous to the rise of the schools of philosophy under Plato and Aristotle (see PHILOSOPHY). They taught disputation, rhetoric, and politics, taking fees from their pupils, and for a hundred years were almost the only schoolmasters of the Greeks. They had no uniform philosophy, but were, in general, skeptical and indifferent to truth. Their influence on literature and oratory was beneficial, but their insincere method of reasoning had a mischievous effect on conduct. They were despised by Socrates and his school, who taunted them with "selling wisdom" and with taking pride in "making the worse appear the better." Some of the most famous sophists were Protagoras, Gorgias, Prodicus, and Hippias.

SOPHOCLES, *sof' o kleez* (about 495-406 B.C.), a Greek dramatist, born at Colonus, a suburb of Athens. At the age of twenty-eight, he submitted his first play, *Triptolemus*, in competition with Aeschylus, and won first prize. He served in political offices as a patriot, rather than as a politician. In 440 B.C., he was chosen one of the board of generals in the war against the aristocratic party of Samos, was later general in the Peloponnesian War, and a member of the committee that reported on the proposed oligarchical constitution for the state. In his old age he held a minor priesthood, and at his death was given heroic honors.

In talents and virtues, Sophocles was constantly offered as an ideal to the Athenian youth, and his whole life was an unusual com-

bination of grace, versatility, and success. He won prizes in youth, manhood, and old age; for a period of thirty-two years, he earned the first prize about twenty times, never falling to the third place.

Changes in the Drama. His dramas, of which seven out of the total number of 120 are extant (with fragments of others), represent marked development in dramatic technique. He introduced a third actor, thus enlarging the scope of the action; increased the chorus from twelve to fifteen members and subordinated it to the main plot, thus making it essentially the ideal interpreter of the action; and completed each play in itself, instead of grouping three about a central theme, as Aeschylus and other dramatists had done. His style is characterized by elegance and beauty; his characters are Hellenic in their calm reserve, and human in the distinctness with which they are presented. In all there is a pervading sublime, religious reverence, and his conception of Fate is no longer the traditional one of making it a blind, external power, but something, instead, that results inevitably from character and circumstance. Sophocles, Aeschylus, and Euripides were the foremost dramatists in the golden age of Pericles.



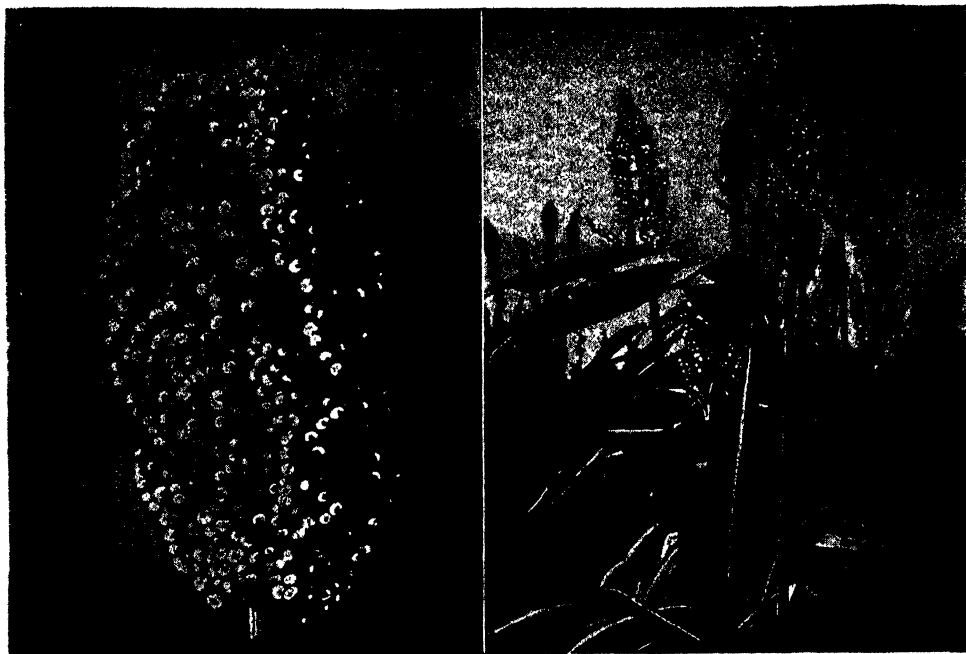
SOPHOCLES

[From a bust in the Capitoline Museum, Rome.]

Dramas That Are Extant. His *Antigone* is a problem play, revealing the tragedy of a conflict between the law of the individual conscience and the dictates of political authority. In *Oedipus Tyrannus*, he makes use of what has been called Sophoclean, or dramatic, irony, and shows how the hero Oedipus unknowingly but inevitably fulfills the oracle which has decreed that he should live in incestuous marriage with his mother, after slaying his father. The other plays that now exist complete are *Ajax*, *Electra*, *Trachiniae*, *Philoctetes*, and *Oedipus at Colonus*.

SORATA, *so rah' tah*. See ANDES.

SORBONNE, *sohr bon'*, a famous institution of learning in Paris, the outgrowth of a medieval college of theology. It has belonged to the city of Paris since the middle of the nineteenth century. The modern Sorbonne is housed in one of the finest university buildings in the world, dating from 1889 and known as *La Nouvelle Sorbonne* ("the New Sorbonne"). The institution maintains faculties of science



Photos: U. S. Department of Agriculture

TWO VARIETIES OF SORGHUM

White milo, at the left; white durra, at the right.

and literature and has splendidly equipped laboratories, lecture rooms, and libraries. The faculties of science and letters of the University of Paris have their headquarters in the Sorbonne building.

The old Sorbonne was founded in the thirteenth century by Robert of Sorbon, and was originally a hall of residence and study for poor theological students. In the course of time, the institution became one of the strongest theological schools on the Continent. In the seventeenth century, its buildings were reconstructed by Richelieu, who built a magnificent chapel for its students. Among the changes that occurred when the institution was reorganized after the French Revolution was the abolishment of the faculty of theology.

Many American students attend the Sorbonne on French scholarships.

SOREL RIVER. See RICHELIEU RIVER.

SORGHUM, *sawr' gum*, a group of plants belonging to the grass family, one class of which contains a sweet sap from which syrup is made. The sorghums are tall, earless plants, bearing terminal heads of small seeds. The syrup-yielding plants are known as *saccharine*, or *sweet sorghums*, and the others as *non-saccharine*, or *seed sorghums*. *Kafir corn* and *broom corn*, both of which are described under their titles in these volumes, are the best-known varieties of the non-saccharine class. The saccharine varieties are cultivated for

their sap, as forage plants, and as packing for silos.

In the manufacture of syrup from sorghum, the stems are passed through roller mills, and the expressed juice is subjected to various processes of boiling, skimming, evaporation, filtration, and purification. The sap does not make good sugar, because of difficulty in purifying the juice. Refuse from the mills is fed to stock. Sweet sorghums are good drought-resistant crops, and are most widely grown in South Dakota, Kansas, Nebraska, Texas, Oklahoma, and regions to the southeast. About 31,800,000 gallons of sorghum syrup are produced each year in the United States. B.M.D.

White Milo, a variety characterized by slender stalks which attain a height of from seven to ten feet, or even more. The stalks produce a large number of leaves, and contain considerable juice. The heads are rather short, compact, and thick, and are borne on stems that are erect, pendant, or "goose-necked." White milo stools abundantly, and produces wide branches. Its seeds are white, large, and flattened on two sides. It matures fairly early, the first crops being ready for harvesting in from 70 to 110 days after planting.

White Durra, sometimes called **JERUSALEM CORN**, has during recent years been replaced gradually by better varieties of grain sorghums. The stalks are rather slender, and attain a height of from four to eight feet. Like most of the durras, the white contains little juice, and produces such a scant number of leaves as to be considered of very low value for

forage purposes. A large percentage of the heads curve or turn down on the stems. They vary from six to ten inches in length, and are broad, thick, egg-shaped, and fairly compact. The kernels, as well as the hairy glumes, are almost white, and are large and strongly flattened on two sides, being almost broad wedge-shaped. The grain has been used for chicken feed with much success. Seed ripens in a comparatively short time, depending upon weather conditions. Crops usually mature in from 75 to 100 days after planting.

SORORITY, from the Latin word for *sister*, is the name applied to a Greek-letter society for women students in colleges and universities, corresponding to the *fraternity* for men. In all essential respects, the aims and organization of the two are identical.

Development. As a higher education for women became popular, they began entering the universities to share the educational advantages of their brothers. It was only natural that they should come to feel the same need of sympathetic companionship, and of a definite outlet for their social desires, as the men had felt and had met through the organization of their fraternities. The latter furnished a ready-made model after which the women could pattern.

The first secret society for women was the *Adelphian*, which, in 1851, was organized at Wesleyan College, Macon, Ga. Although this did not begin existence under a Greek name, it followed the fraternity idea in its other features, and in 1905 the name itself was changed to Alpha Delta Phi sorority. Kappa Alpha Theta is usually spoken of as the first sorority, since it was the first to use the Greek letters; it was founded at DePauw University in 1870. In the same year, Kappa Kappa Gamma was started at Monmouth College, in Illinois.

Several of the honorary fraternities admit women as well as men to membership. Among these are Phi Beta Kappa, the oldest of the honorary fraternities; Sigma Xi, similar to Phi Beta Kappa, but confined to students following scientific lines; Phi Kappa Phi; and Alpha Omega Alpha.

Organizations of high-school girls and of women for social purposes are also sometimes known as sororities.

Related Subjects. The reader is referred in these volumes to the following articles:

College	Fraternity	Phi Beta Kappa
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SORREL, the name applied to several plants belonging to the buckwheat family, whose juicy leaves and stems contain oxalic acid and have a sour taste. In Europe, particularly in France, some species are cultivated extensively for use in soups, salads, and for greens. The common American species is a low-growing plant with three-lobed, arrow-shaped leaves, and spikes of small white, pink,

or yellow flowers. *Sheep sorrel*, *sour sorrel*, and *red sorrel* are some of the names for this plant, whose pleasantly acid leaves the children like to chew. The last-mentioned name refers to masses of three-angled, reddish seeds borne by the plant. Since the sheep sorrel is a weed that grows well in acid soil, its presence in a meadow indicates that the land is in need of lime.

B.M.D.

Classification. The sheep sorrel is classed as *Rumex acetosella*, family *Polygonaceae*.

SORREL TREE, OR SOURWOOD, a beautiful tree of the heath family, growing plentifully in the woods of the Southern United States, and also found as far north as Pennsylvania, Indiana, and Ohio. The names refer to the taste of the leaves and twigs, which hunters and woodsmen sometimes chew to quench their thirst, *sorrel* being derived from an Old French word meaning *sour*. The tree often reaches a height of fifty to sixty feet, and has reddish-gray bark and smooth, oblong leaves. In summer it bears graceful clusters of small, white, bell-shaped flowers, which are followed by little, downy capsules. In spring the foliage is bronze-green, but in autumn it turns a brilliant scarlet. The wood is used for turning articles such as tool handles and bearings for machinery, while the leaves furnish a black dye.

G.M.S.

Scientific Name. The sorrel tree belongs to the family *Ericaceae*. Its botanical name is *Oxydendrum arboreum*.

S O S. See RADIO COMMUNICATION; SIGNALING AND SIGNALS.

SOTHERN, EDWARD HUGH (1859-), an American actor, born at New Orleans, La. His father, also an actor, was opposed to his child's following the same profession, and therefore took the boy to England at the age of five, and began to train him in the fine arts, especially painting. In 1879, however, Edward refused to continue art work, and commenced his theatrical career in New York. He toured America and England with John McCullough, but met with little success until 1884, when he became leading man in Sardou's *Scrap of Paper* and other popular dramas. Three years later, he took the most important rôle in *The Highest Bidder*, an old comedy found among his father's papers.

E. H. SOTHERN

Sothern's work was heartily praised by the critics, and Daniel Frohman, the New York theater manager, engaged him for a long term of years. In this period of his career, he made notable successes of such plays as Belasco's *Lord Chumley*; *The Prisoner of Zenda*, adapted from Anthony Hope's novel; and Justin McCarthy's *If I Were King*. In 1900 he began his acting of Shakespearean tragedies, and soon associated Julia Marlowe with him in productions which for years set the American standard for such plays. Sothern married Miss Marlowe in 1911 (see MARLOWE, JULIA). He published his autobiography in 1916.

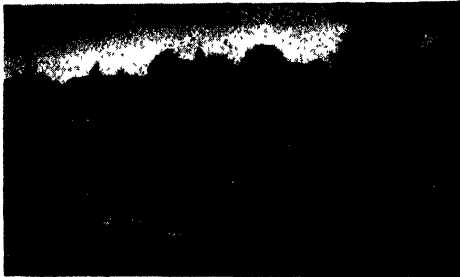
SOU, *soo*. See FRANC.

SOUDAN, former spelling of Sudan (which see).

SOUL, TRANSMIGRATION OF THE. See TRANS-MIGRATION OF THE SOUL.

SOULÉ, *soo la'*, PIERRE. See OSTEND MAN-IFESTO.

SOUND. If you touch a gong while it is sounding, you can easily feel that it is vibrating, and if you press against it to stop the vibrations, you bring the sound to a sudden end.



RIPPLES ON WAVES

As waves enlarge in circles from the point where disturbance occurs, so do sound waves travel from the exciting cause. [See illustration of waves of sound, elsewhere in this article.]

The to-and-fro movement of the gong is the cause of what you hear. As the sides move outward, they compress the air in all directions, and as they swing back, they allow the air to expand; each particle of air presses against the particles beyond it, then draws back, and so the atmosphere about the gong is formed into a series of globular shells alternately of compressing and of expanding air. When these reach the air in your ear, the changes of pressure on your eardrum send the sensation of sound to your brain.

How Sounds Differ. Since the surges of air against the eardrum are the cause of sound, it is plain that whether a noise is loud or soft, high-pitched or low, pleasant or unpleasant, must depend upon the characters of the sound waves and of the individual ear.

Loudness. If you put your feet down gently when you walk, you move quietly; if you

stamp, a loud noise results. The greater the force you exert, the stronger the compression which the resulting vibrations produce, and the more intense the effect upon your ear. The tramp of soldiers marching is louder than the noise from one person's feet, because the simultaneous waves from sources close together combine their force. But sometimes two sounds result in no sound, for if the compression from one meets an equal expansion from another, the waves at that point cease. Thus, if you turn a tuning fork slowly around near your ear, you will find four positions in which you cannot hear it, unless you hold something between one of the prongs and your ear.

If you hear four trumpets blown 100 yards away, the sound seems to you about as loud as that from one trumpet fifty yards away, for when the one source of waves is twice as far from you as is the other, the spherical surface of a wave from the first is four times as great as the surface of one from the second, and it contains four times as many particles to share the energy of the sound. The scientific statement of this law is that *the intensity of a sound varies inversely as the square of the distance from its source*.

Most of us have tried the experiment of holding a watch between the teeth or pressing it against the forehead. At each vibration caused by the ticking, a wave of compression and expansion travels through the bones of the head just as it would through the air. In fact, the denser the object, the better, as a rule, will it transmit sounds. The reason will be plain to anyone who has played with pool balls; if half a dozen balls are placed in a row, all touching, a slight tap at one end will move the ball at the other end, but if the row is formed with space between the balls, the first one must be hit quite hard in order to affect the last. The denser a substance, the closer together are its particles of matter, and a sound, therefore, will travel through steel or wood, or even through water, better than through air, but will not progress at all in a vacuum.

Why is it, then, that the walls of a house soften the noises of the street? The reason is that, when sound waves traveling in one medium meet the surface of another, they are partly reflected, just as light is mirrored by a transparent pane of glass. Nature has taken advantage of this law in giving rabbits and other animals ears which they can hold erect to gather in a greater volume of sound; each wave impulse that strikes the wall of the ear at an angle is reflected inward at an equal angle, and so reaches the eardrum. Sound reflection is also responsible for echoes.

High Tones and Low. The rapidity with which an object vibrates is what determines the *pitch* of the sound given out. Thus a

PROPERTIES OF SOUND



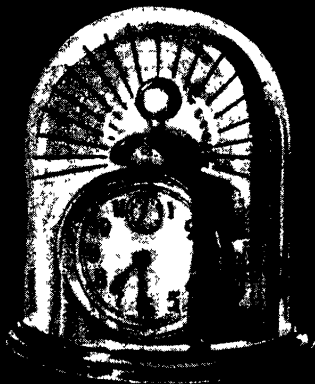
AIR-CONDUCTED
SOUND WAVE



SOUND TRAVELS BETTER
THROUGH DENSE MATERIAL

STEEL-CONDUCTED SOUND WAVE

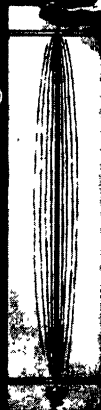
SOUND IN A VACUUM
JAR IS ALMOST INAUDIBLE



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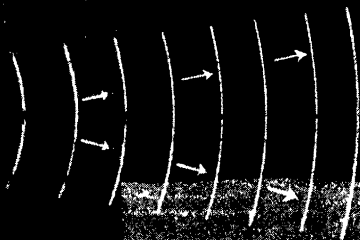
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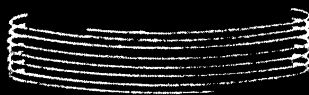
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- ① A THICK STRING WILL GIVE A LOWER NOTE THAN A THIN ONE.
- ② BY TIGHTENING A STRING THE PITCH IS RAISED.
- ③ BY SHORTENING A STRING THE VIBRATIONS INCREASE. A HIGHER NOTE RESULTS.

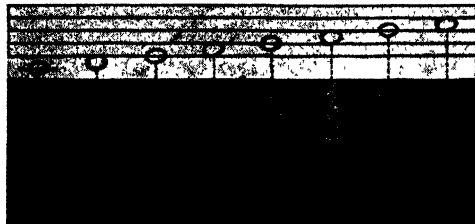


THE REFLECTION OF SOUND WAVES
FROM AN OBSTACLE PRODUCES AN
ECHO. DIAGRAM SHOWS THE THEORY.



LIGHT TRAVELS 186,000 MILES A
SECOND - MORE THAN SEVEN TIMES
THE DISTANCE AROUND THE WORLD.
SOUND TRAVELS 1,090 FEET A SECOND.

soprano, to sing high *C*, must send out four waves from her vocal organs in the time that a contralto singing middle *C* gives out one. The actual number of vibrations for middle *C*, whether sounded by human vocal cords, piano strings, or wind instruments, is 256 per second. The ear takes note of sounds containing as many as 30,000 vibrations a second, but does not recognize a tone where the number of vibrations is fewer than 30. Probably, the



SCALE OF "C" ON THE STAFF AND KEYBOARD

average ear does not hear sounds whose vibrations exceed 15,000 or 16,000. Many insects make sounds of so high a pitch that they cannot be heard by the human ear.

The conditions which regulate the rate of vibration of any object are nearly all known, and our knowledge of them is utilized in making and in tuning musical instruments. Thus the low strings on a mandolin are thicker than the high strings, for to double the weight of a string halves its number of vibrations. To raise the pitch of a string, you tighten it, doubling the number of vibrations if you quadruple the tension, and to play a high note, you shorten the string with your finger, doubling the number of vibrations if you halve the length. The same laws govern other stringed instruments and the drum. The pitch of wind instruments depends on their length, and on whether or not they are open or closed at the ends.

Noise or Music. If we leave out of consideration the differences in personal likes and dislikes, the only distinction between musical and unmusical sounds is that the former have regular, the latter irregular, vibrations. A confusion of sounds makes *noise*, for the various sound waves mingle and cause the ear to receive a jumble of sensations. If you stand on a hill above a city, or high up in a skyscraper, you find many of the sounds of the city, which below are so disagreeable, to be distinct musical tones; but, as in music, notes which separately are pleasant may produce discord if sounded together.

Discord in music seems to be due to what are known as *beats*. If you strike any two adjacent piano keys simultaneously, you can distinctly hear throbs in the sound. The waves from the two notes start at the same instant, but because the upper string vibrates faster

than the lower, its first push against the air is completed sooner, and it starts to draw back while the other is still moving outward. It starts its second push still farther ahead, and continues to gain until after a time an instant comes when the expansive force of one exactly balances the contractive force of the other, and there is silence. The next instant, the one wave has gained on the other again, and with the two once more moving in the same direction, the sound surges out with doubled intensity. Since a beat occurs only as often as one wire has made a complete vibration more than the other, there will be as many beats per second as the difference between the number of vibrations each makes. Notes which sound about thirty beats per second make the most disagreeable combination; above and below that number the unpleasantness gradually decreases, and seventy or more beats per second are not noticeable. When notes differing more than seventy vibrations produce discord, as do *C* and the *B* above it, there are beats with or between the *overtones*. Piano-tuners always listen for beats.

Quality of Sound. *Overtones* are the notes produced when an object vibrates not only as a whole, but also in parts. If you rest a small piece of paper on the center of a violin string, it will not be thrown off while the string is vibrating, for while the left half moves up, the right half moves down, and the center is motionless. Thus, while the whole string is producing the *fundamental* note, each half is producing a note an octave higher, called the first overtone. By vibrating in thirds also, the string sounds another overtone, in fourths another, and so on. Overtones are very important in music, for, as proved by Helmholtz, their number and strength determine quality of tone.

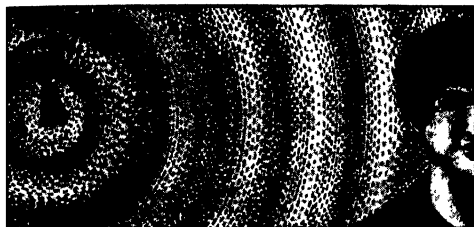
Sympathetic Vibration. If you hold down the loud pedal of a piano, so that all of the wires are free to vibrate, and sing a note into the wires, they will send back the same tone with so much realism that they seem to be mocking you. This is because the waves from the fundamental and overtones of your voice set in motion the wires which are of the proper length, tension, and thickness to sound them. Sometimes a certain note on a piano will cause windowpanes to rattle, and sometimes glass is broken by vibrations set up by music. On the other hand, it is because of sympathetic vibration that an old house gives to music such a mellow sound.

Speed of Sound. Nearly everyone has tried the experiment of counting between a stroke of lightning and the peal of thunder which follows, to learn how far away the flash occurred. If you count in seconds and divide the result by five, you will have an approximately correct idea of the number of miles, for sound travels through the air about a fifth

of a mile in a second, and light covers 186,300 miles in a second, which for practical purposes is an instantaneous rate. The temperature of the air affects the speed of sound; at the freezing point it is about 1,090 feet per second, and increases about two feet for every degree Centigrade, or a little over one foot for every degree Fahrenheit. Sounds travel faster in liquids and solids than through the air. Through water its speed is 4,700 feet per second; along steel wire, 15,700 feet per second.

[See illustration, in the article Echo.]

When There's No Ear to Hear. If the sound waves of the air do not reach the ear, is there sound? Imagine a tree falling a



HOW SOUND WAVES SPREAD

If sound waves could be seen, they would appear as an ever-widening circle, moving from the exciting cause. As a matter of fact, they have been both seen and photographed, and they are as real as a widening circle of ripples on water. If the exciting cause be violent, as when a cannon is fired, the force of the waves of sound may destroy the eardrum.

hundred miles from a human being, or as far from one of the lower animals, or any other form of animal life. Would it make a sound?

The answer to such questions depends on our definition of sound. If we think of sound as a sensation, then there would be no sound. But if we think of it as that which can cause the sensation, then there would be sound. Physicists always regard sound in the latter sense.

How the Radio Set Transmits Sound. The waves that carry wireless messages through space are electromagnetic radiations of the same nature as visible light. In the studio of the broadcasting station, the sounds of voices or instruments enter a microphone, which reproduces, in the form of electrical pressure, the variations of air pressure produced by the sound waves. Wires carry the electrical impulses to a transmitting apparatus, in which they are transformed into electromagnetic waves that are sent into the ether through a system of wires called an antenna. These radio waves, traveling outward in all directions at the rate of 186,300 miles per second, are collected by an antenna that transforms them into alternating electrical current. A detector changes the alternating current into direct current, and another device changes the

electrical impulses into sound waves that the ear translates as words or music.

A striking instance of the difference in the rates of travel of sound waves and radio waves may be seen in the following example. A speaker addressing a large audience in California may be heard by a listener in New York before he would be heard by those in his immediate audience. His voice, carried by electricity at the rate of 186,300 miles per second, would travel 3,000 miles before the sound waves would travel 100 yards. See RADIO COMMUNICATION. A.L.F.

Problems. (1) To illustrate intensity of sound:

A hears a sound at a distance of 10 feet, and B at a distance of 50 feet. Which one hears the sound more loudly, and how much more loudly?

SOLUTION

Intensity of sound varies inversely as the square of the distance. Hence A hears the sound as much more loudly than B as the ratio of 50^2 to 10^2 , or 2,500 to 100. Therefore the sound seems $\frac{2,500}{100}$, or 25, times as loud to A as to B.

(2) To illustrate speed of sound:

Assuming that sound travels in air at the rate of 1,090.5 feet per second at 0°C , at a temperature of 25°C . what distance away would a lightning flash be from a person hearing the thunder 6 seconds after the flash?

SOLUTION

Increase of speed of sound being 2 feet per second for every Centigrade degree, in this case the speed increase is 2×25 feet per second, or 50 feet per second. Then the thunder reaches the listener's ear at the rate of 1,090.5 feet per second plus 50 feet per second, or 1,140.5 feet per second.

Time between flash and sound being 6 seconds, the flash was $6 \times 1,140.5$ feet away, or 6,843 feet.

(3) A person sets his watch by a whistle which blows at 12 o'clock. The whistle is 1 mile away and the temperature 20°C . How many seconds will the watch be incorrect?

SOLUTION

Increase in speed = 2 feet per second for each degree C , or 2×20 feet, or 40 feet. Speed of the sound per second is therefore 1,090.5 feet + 40 feet, or 1,130.5 feet. If the sound travels 1,130.5 feet in 1 second, it travels for $\frac{5,280}{1,130.5}$ seconds, or 4.67 seconds (approximately), before the person hears it one mile away. Therefore he will set his watch 4.67 seconds slow.

(4) At 0°C . the speed of sound through iron is 5,127 meters per second, and through air, 332.4 meters. A blow is struck at one end of an iron rail. A person stationed 3,418 meters down the rail hears two sounds, one carried through iron and one through air. What is the interval between the sounds, temperature being 0°C ?

SOLUTION

$\frac{3,418}{5,127} = \frac{2}{3}$ or 0.67, approximate number of seconds it takes the sound to travel through the length of iron rail.

$\frac{3,418}{332.4} = 10.28$, approximate number of seconds for the sound to travel through air.

ro.28—0.67=9.61. Therefore the person hears the sound through the rail 9.61 seconds before he hears it through air.

Related Subjects. The following topics in these volumes may be consulted in connection with this article on sound:

Acoustics
Ear

Echo
Harmonics

Light
Music

SOUNDING, the process by which water depths are determined. In very early times, attempts were made to find the depth of water for the purpose of aiding navigators, but it was not until the nineteenth century that instruments were invented which could be successfully used for deep-sea sounding. The introduction of submarine cables made necessary a detailed knowledge of the contour of the ocean bed, and greatly stimulated efforts to perfect a satisfactory sounding machine. The simplest sounding device is the plummet, a lead shaped like a window weight, to one end of which a stout cord is attached. It is thrown into the water, and as it sinks it draws the cord with it, which, being marked in feet, shows the depth. See **PLUMMET**; **LEAD**.

The plummet was replaced by a diving rod, which is a hollow cylinder with valves at the top and bottom, opening and closing so that a specimen of the bottom may be carried up. For deep-sea and scientific purposes, a larger sounding machine has been developed. It consists of a device which carries nearly 6,000 fathoms of wire rope, and is fitted with two brakes, one for holding the reel and the other for stopping it when the weights strike the bottom. As the wire passes over a registering wheel, the amount of wire run is indicated on a dial.

The development of the science of measuring distance by vibrations of sound had a marked effect upon deep-sea sounding. During the World War, this method was used to detect and locate submarines. The principle worked on is that a sound starting at or near the surface of the water travels through the medium of water at a known average speed until it hits bottom or something solid, and then it is reflected back as an echo. This method has not been perfected, but studies are being made to determine the exact velocity of sound in water instead of the average, which is 4,700 feet per second. The effect of salinity, and an accurate means of determining the time between the original sound and its echo, are the principal points of investigation.

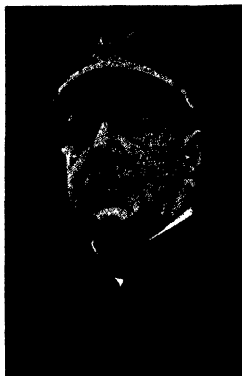
SOUR CLOVER. See **MELLIOT**.

SOUR GUM. See **PEPPERIDGE**.

SOURIS, soo' ris, RIVER. See **ASSINIBOINE RIVER**; **NORTH DAKOTA** (Rivers and Lakes); **SASKATCHEWAN** (Surface and Drainage).

SOUSA, soo' zak, JOHN PHILIP (1854-), the most famous composer of band music America has produced. He is also renowned

as a bandmaster. Sousa's genius for composing stirring melodies for band organizations has won him the title "the March King." He was born in Washington, D. C., and studied music there, making a specialty of the violin and becoming conductor of an orchestra at the age of seventeen. From 1880 to 1892, he conducted the United States Marine Corps Band, which, under his leadership, became famous. It was especially in demand to play the spirited, tuneful marches which its leader was then beginning to compose. Sousa founded his own band in 1892, and during the next eight years, the organization gave concerts all over the United States and Canada. Between 1900 and 1905, Sousa and his band made four tours of Europe, and in 1910 and 1911, a tour of the world. Many honors were bestowed upon the leader, among them the Palms of the French Academy, the rank of Officer of Public Instruction by the French government, and the Grand Diploma of Honor by the Academy of Hainaut, Belgium.



JOHN PHILIP SOUSA

Sousa was selected to organize bands at the Great Lakes Naval Training Station, in Illinois, after the United States entered the World War. He was also made an officer in the United States navy, with the provisional rank of lieutenant. In 1923 the University of Marquette conferred on him the degree of Doctor of Music. He has since become a popular radio entertainer.

His Principal Works. Sousa's collection entitled *National Patriotic and Typical Airs of All Countries* has been officially adopted by the United States Navy Department. His numerous popular marches include *The Washington Post*, *El Capitan*, *Liberty Bell*, *Hands Across the Sea*, *National Emblem March*, and the universally popular *Stars and Stripes Forever*. He has also written light operas, descriptive suites, and a symphonic poem. His literary works include the novels *The Fifth String* and *Pipetown Sandy*, and a descriptive book, *Dwellers in the Western World*.

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SOUTH AFRICA, UNION OF. See **UNION OF SOUTH AFRICA**.

SOUTH AFRICAN RAILWAYS. See **UNION OF SOUTH AFRICA**.

SOUTH AFRICAN WAR (1899-1902), a struggle for supremacy in South Africa between the British government and two Boer republics—the South African (now the Transvaal) and Orange Free State. This war grew out

of the jealousy and ill-will existing between the Boers, or Dutch settlers, and the foreigners, or *Uitlanders*, most of whom were British subjects. In 1884 gold was discovered in the Transvaal, and the large influx of Uitlanders to the district served greatly to disturb the placid Boers. The latter, who believed that the Uitlanders hated them and would seek to gain political control of the government, put forth every effort to check such a plan. Under the leadership of their president, Paul Kruger, they so modified the naturalization laws that in 1887 the term of residence necessary for securing citizenship was fixed at fifteen years. The foreigners protested against this and other restrictions as unjust, and in 1896 the opposition took concrete form in an armed uprising known as Jameson's Raid.

Negotiations between the British government and that of the South African Republic failed to secure a peaceful solution of the difficulty, and in October, 1899, war was declared, the Orange Free State joining with its sister republic against the British. At the outbreak of hostilities, an army of 12,000 British troops was stationed in Natal, and small detachments were posted at Kimberley, on the western frontier of Orange Free State, and on the Bechuanaland and Rhodesian borders. The Boers swarmed into Natal and shut up the British force at Ladysmith. The English troops under General French (later Earl of Ypres) checked the Boer advance into Cape Colony, and Lord Methuen opened the way to Kimberley. The British then met with a series of discouraging reverses, but in January, 1900, reinforcements arrived under Lord Roberts, Lord Kitchener acting as his chief of staff.

A new campaign was immediately begun. On February 27, the Boer general, Cronje, surrendered to Lord Roberts at Paardeberg in Orange Free State, and the following day a final and successful attempt raised the siege of Ladysmith, where for months the British troops had been suffering from disease and starvation. British advances were made in the northern part of Cape Colony, and on March 13 Lord

Roberts entered Bloemfontein, the capital of Orange Free State, and the republic was proclaimed British territory.

After encountering the Boers under General Louis Botha, on the Vet River, Lord Roberts crossed the Vaal and entered the city of Johannesburg on May 31. Five days later, he took Pretoria, the capital of the South African Republic, and President Kruger fled to the Portuguese territory in the east. The British forces in Natal pushed north, driving the Boers before them, and united with Lord Roberts in a drive against General Botha, who was forced east into the mountains and surrendered on Portuguese territory, in September, 1900. The South African Republic was then declared British territory, under the name of the Transvaal.

The rest of the struggle was characterized by guerrilla warfare; but the Boer leaders, one after another, were defeated, and the final surrender was made in May, 1902. The total Boer enlistment did not exceed 95,000, while the British forces numbered nearly 200,000.

The terms of peace, signed at Pretoria, May 31, 1902, provided that the Boers surrender all arms and munitions and swear loyalty to the British sovereign, Edward VII. In return, all prisoners outside of the colony were to be brought back to their homes, and no proceedings were to be taken against the burghers for action in connection with the war. Civil administration was to succeed the military government as soon as possible, and be followed by representative government; the Dutch language was to be allowed in courts of law and be taught in schools; a sum of \$15,000,000 was to be granted to aid in the restoration of property. Since 1910, the Transvaal and Orange Free State have been self-governing provinces of the Union of South Africa.

Related Subjects. Further information on various phases of this subject may be gained in these volumes from the following articles:

Boer
Botha, Louis
Great Britain
Jameson, Leander Starr
Kimberley

Kitchener, Horatio H.
Kruger, Stephanus J. P.
Rhodes, Cecil John
Roberts, Frederick S.
Union of South Africa



SOUTH AMERICA, one of the great continents into which the earth is divided. With North America, with which it is connected by the narrow Isthmus of Panama, it forms what is known as the New World, a name adopted

after the discovery of America, near the end of the fifteenth century. The southern continent, combined with Mexico and Central America, is usually called *Latin America*, because its white inhabitants are chiefly of Span-

ish or Portuguese descent; in fact, only Brazil is Portuguese, all the other countries being Spanish in language and tradition. Though North and South America have developed along different lines from an economic standpoint, it is significant that they are the world's greatest centers of democracy. In all their vast territory there is not one country governed as a monarchy, though the British and the Dutch control small areas.

Size and Location. Like North America, the southern continent is irregularly triangular in shape, with its widest extent in the north and the apex in the south. It has an estimated area of 7,700,000 square miles, and occupies nearly one-seventh of the total land area of the globe. Its greatest length, from Punta Gallinas to Cape Horn, is about 4,800 miles, and its greatest width is 3,300 miles. It extends about 1,000 miles nearer to the South Pole than does Australia, which is considered the southernmost continent. South America is only slightly smaller than North America, but it contains less than half as many inhabitants.

The People. South America's 67,000,000 people represent a number of races. There are, first, the descendants of the native Indians,

who were in possession of the continent when the white man discovered it. The natives were divided into numerous tribes, speaking different but related languages and having various degrees of civilization. The Spaniards and the Portuguese who came here married Indian women, and this intermarriage produced a race of half-breeds, or *mestizos*. By far the greater proportion of the inhabitants of South America belong to this race of mixed blood. Later on, negroes from Africa were brought as slaves, and these by intermarriage contributed yet another strain of blood to the population. As a result of the intermingling of these various races, there is no color prejudice in South America. The race problem, as between white and negro, which is a cause of friction in North America, does not exist in the southern continent. Of late years, large numbers of Italians and Spaniards have emigrated to the continent, settling particularly in Argentina. A number of Germans, Englishmen, and citizens of the United States are located in the large towns. Spanish blood, language, religion, and culture, however, predominate in every country except Brazil, which is Portuguese in these respects, as stated above.

Physical Features of South America

Plains and Mountains. Looking at a physical map of the continent, one finds that there are several points of resemblance between its physical structure and that of North America. The most striking feature, as in North America, is the great mountain system that extends along the western coast, forming, as it were, the backbone of the continent. This mountain system is known as the Andean Cordillera, or Andes. Next to the Himalayas in Asia, it is the highest mountain range in the world, and its loftiest peak, Aconcagua, is 23,080 feet above the sea.

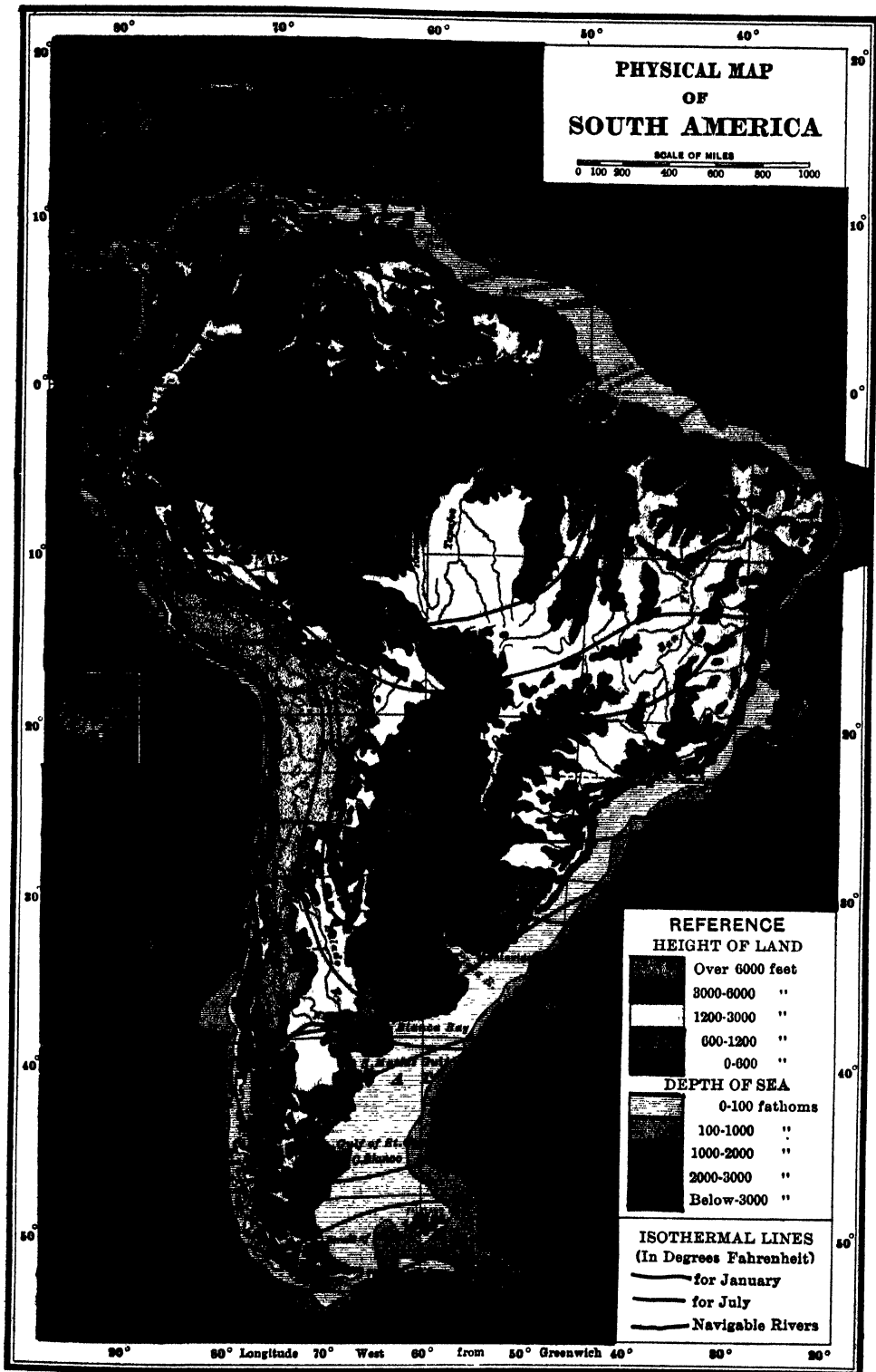
The Andes Mountains, especially in the region around the equator, contain several active volcanoes which are among the highest in the world. These are Chimborazo, 20,498 feet high; Cotopaxi, 19,613; Antisana, 19,260; Cayambí, 19,186; Maipu, 17,576, and Sangay, 17,464. This region is subject to frequent and violent earthquakes. Between the Andes and the Pacific Ocean, there stretches for a distance of 4,000 miles a narrow plain, which has an average breadth of forty miles and a maximum breadth never exceeding a hundred miles. Much of this area is arid desert, merging toward the extremities of the continent into forest lands.

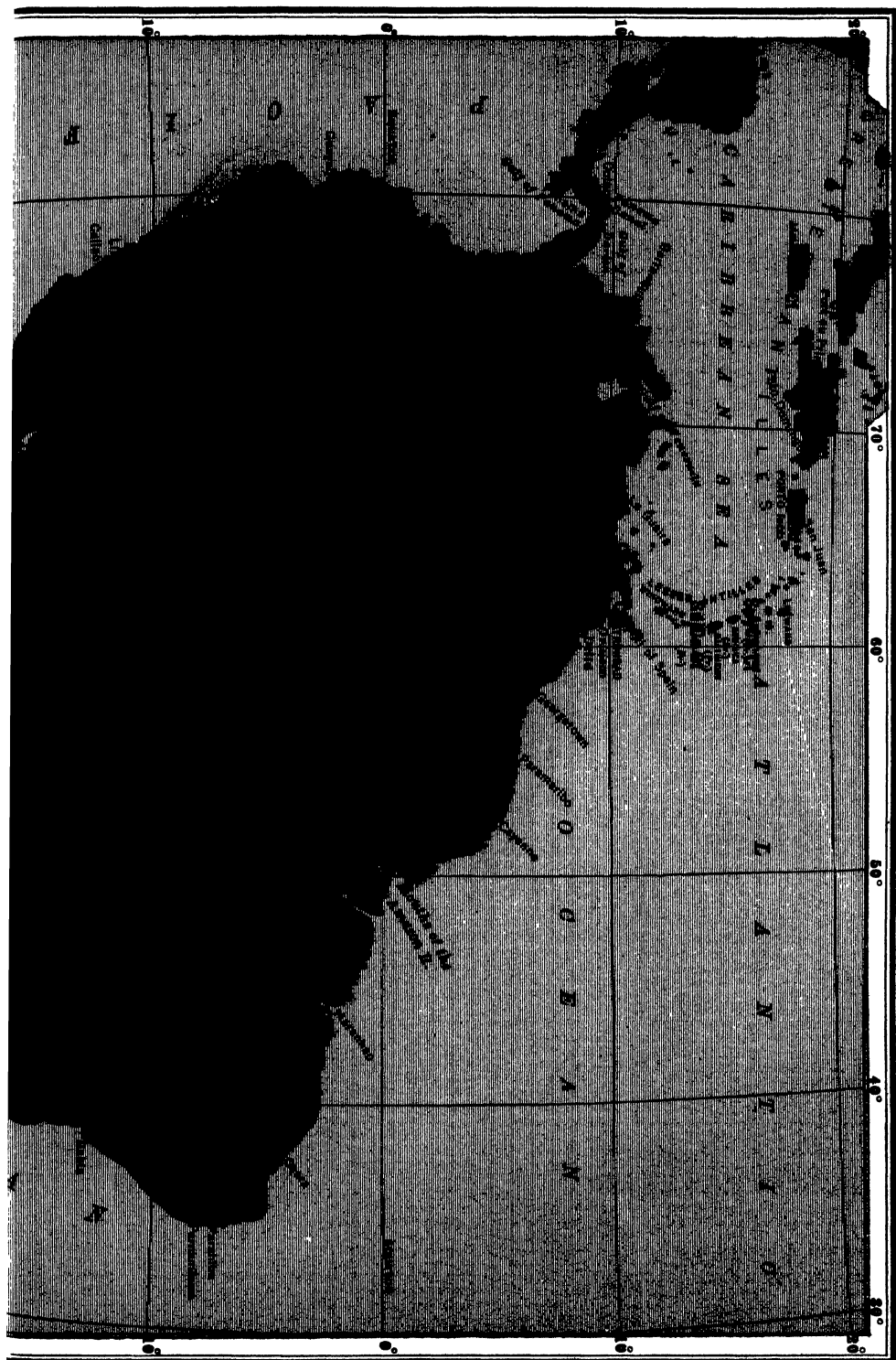
To the east of the Andes extends the great central plain, as in the northern continent, and, to complete the comparison, it should be noted that this plain is bordered on its eastern side by a series of low mountains known as the

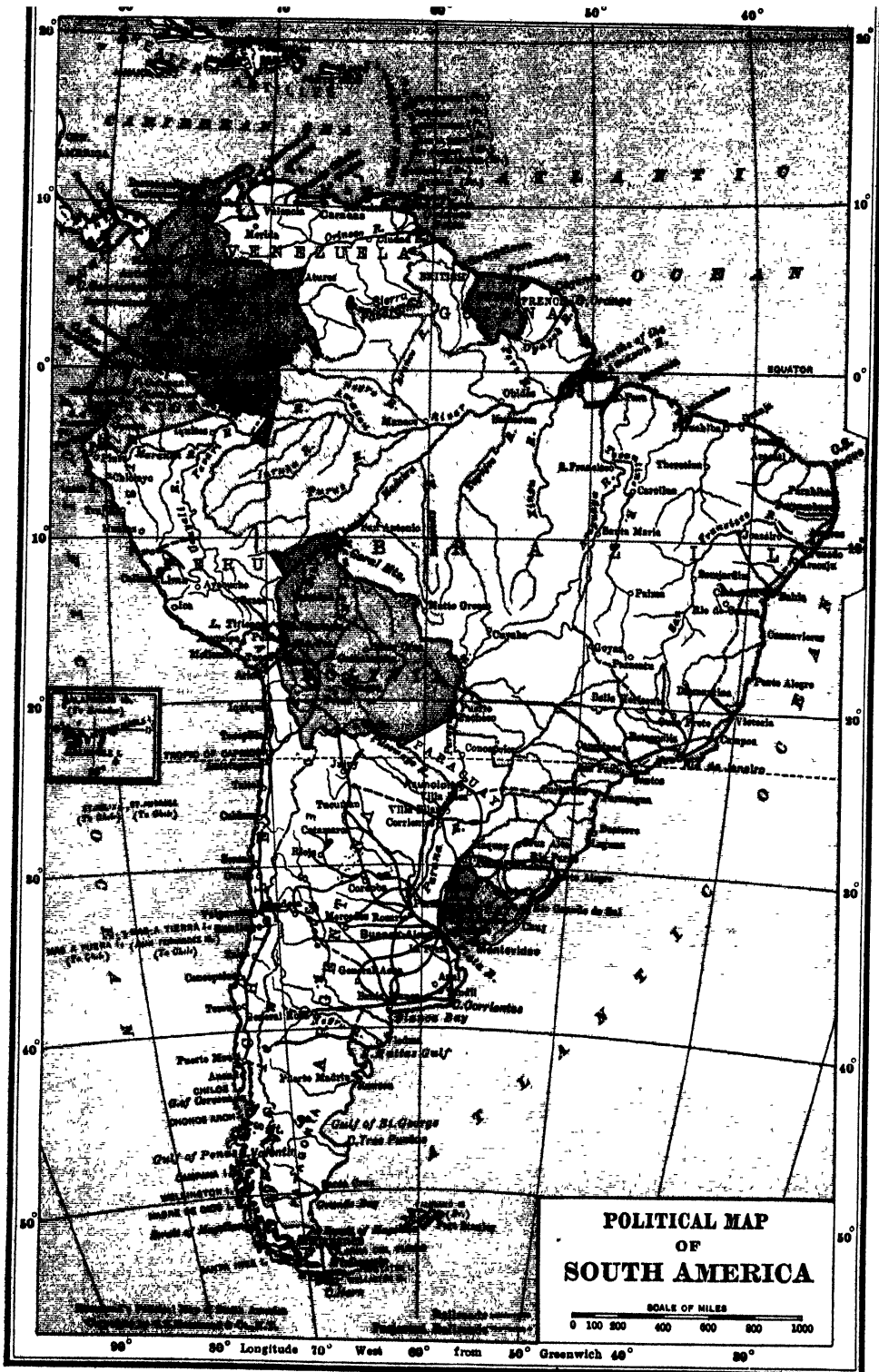
Highlands of Brazil, corresponding to the Appalachian Mountains.

The great central plain, which occupies nearly two-thirds of the continent, can be divided into several distinct regions. In the south are the vast level plains known as the *pampas* of Argentina. North of this extends the broad plateau of Brazil, presenting alternate ridges and valleys, thickly covered with forests on the side next the Atlantic, and opening into steppes or pastures in the interior. North of this stretches the basin of the Amazon, a vast plain of more than 2,500,000 square miles, possessing a rich soil and humid climate. This region is covered with dense forests in which there are wild animals, and throughout the vast section is thinly inhabited by natives, who live by hunting and fishing. White people have never penetrated these jungles. The basin of the Amazon is separated by the plateau of Guiana from the basin of the Orinoco River, which consists of extensive rolling grasslands, called *llanos*.

Coast Line and Islands. With the exception of the southern portion of the western coast, which is indented by numerous fiords and is bordered by islands, the coast line of South America is remarkably regular. In this respect South America resembles Africa, while North America resembles Europe. The large indentations are the Gulf of Darien, on the north; the mouth of the Amazon, on the northeast; and the Bay of Rio de Janeiro, the mouth







Engraved and printed expressly for THE WORLD BOOK

How to Read a Map; See page xvi, facing text page 1.



Photo: U & U

THE SNOW CREST OF CHIMBORAZO

This old volcano towers 20,498 feet toward the sun, south of Quito, in Ecuador

of the Rio de la Plata, Blanca Bay, the Gulf of San Matias, and the Gulf of Saint George, on the southeast. The only important indentation on the Pacific coast is the Gulf of Guayaquil, which indents the coast of Ecuador.

There are few islands belonging to the continent. Those worthy of mention are Trinidad, off the northern coast; Tierra del Fuego, separated from the mainland by the Strait of Magellan; the Falkland Islands, east of the southern extremity of the continent; and the Galapagos Islands, situated at the equator, west of Ecuador.

Rivers. South America contains the largest river system in the world—the Amazon—which drains nearly one-third of the continent. To the north of the Amazon is the Orinoco River, and to the south is the Plata. These great river systems bear a striking resemblance to those of North America. Thus, the Amazon may be compared to the Saint Lawrence; the Orinoco to the Saskatchewan-Nelson; and the Plata to the Mississippi-Missouri. Among the other important rivers are the Tocantins, the São Francisco, the Magdalena, the Parana, the Paraguay, the Uruguay, the Rio Negro, and the Colorado, all of which flow into the Atlantic. Because of the nearness of the Andes

to the coast, the rivers flowing into the Pacific are short.

Lakes. In striking contrast with North America, the southern continent contains very few large lakes. The largest is Titicaca, situated in the Andes between Bolivia and Peru. It covers an area of about 3,200 square miles, or about two-thirds the area of Lake Ontario, and lies at an altitude of nearly two and a half miles above the sea. It is 130 miles long, about thirty miles wide, and has a maximum depth of 700 feet.

Climate. All of the continent north of Rio de Janeiro lies within the tropics, while the southern portion is in the South Temperate Zone. In contrast with North America, this continent has a remarkably equable climate, for in the northern portion the intense heat is greatly modified by the altitude, while the southern portion is free from sudden changes, because of the nearness of the ocean and the influence of the mountains. The temperature during midwinter averages about 80° Fahrenheit in the north and 35° in the south; during midsummer it averages about 85° in the north and 50° in the south. The lowlands along the Orinoco and the Amazon and the coast of Brazil have a hot climate and a high degree

of humidity. The seasons are here just the opposite of those in the northern hemisphere, summer occurring in December, January, and February, and winter in June, July, and August. The rainfall is heaviest on the tropical coastlands and in the Amazon basin, where it averages fifty to seventy-five inches a year, but reaches in some parts 200 inches and more. It diminishes gradually toward the south, merging into the arid region of Patagonia, constituting most of the southern half of Argentina.

Vegetation. The vast tropical region of the north is covered with a luxuriant vegetation representing a large number of species, some of which are of gigantic proportions. Characteristic of this region are the tropical forests called *selvas*, which extend through the whole valley of the Amazon and constitute the greatest continuous forest area in the world. These forests contain giant trees laced together with a drapery of lianas, creepers, and all sorts of twining and climbing plants, while the ground under them is covered by a thick undergrowth, or jungle, which is impenetrable in many places, and filled with myriads of flowers of rare and exquisite pattern. This type of vegetation is the result of the great heat and the high degree of humidity produced by the excessive rainfall. In the subtropical regions, the chief trees are palms, bamboos, cedars, mahogany, and ebony trees, while the mountains are covered with conifers, mostly South American pines. South of the Amazon Valley extends the forested plateau of Matto Grosso, whose name means *great woods*, and south of this is the region known as the Gran Chaco of Parana, where the wax palm is the typical tree. A native plant of this region is a holly, from the leaves

of which a beverage called *mate*, or Paraguay tea, is produced. In Argentina forests of beech prevail. The forested regions, extending southward from the Amazon Valley into Argentina, are varied with extensive grasslands where graze millions of cattle and sheep.

Among the valuable tropical trees of South America is the rubber tree. Several trees which

yield important drugs are also found there. Among them are the cinchona (from which quinine is extracted), which grows on the eastern slopes of the Andes in Bolivia, Peru, and Ecuador; and the coca tree (the source of cocaine), found in the tropical valleys of the Andes. There are numerous kinds of trees bearing fruits that are usually very large and covered with extremely thick shells. Among these are the cannon-ball tree and the Brazil-nut tree. Many useful tropical and subtropical plants have been introduced and grow in abundance. Among them are cotton, tobacco, rice, coffee, and cane sugar. Tropical fruits, such as the banana, grow



Photo: Visual Education Service

TYPICAL FOREST OF THE EQUATORIAL REGION

Hundreds of thousands of square miles in the heart of Brazil are covered with dense growths of almost endless variety.

in abundance under cultivation on the torrid coastlands.

Animal Life. South America is noted for the profusion and variety of its animal life, which is different in many particulars from that of North America. The southern continent not only contains a great number of species, but possesses many species of animals that are not found on any other continent. On the other hand, some of the commonest animals, such as wolves, are not found there. About a fourth of all the mammals known occur in South America. There are several families of monkeys, two of which differ from those of the Old World. A group of mammals peculiar to this continent consists of the toothless animals,

such as the bloodsucking bats, sloths, anteaters, and armadillos. The largest of the native mammals is the tapir.

The most powerful of the flesh-eating animals is the jaguar, which is the only formidable beast of prey on the whole continent. Curiously enough, almost all of the wild animals so abundant in Asia and Africa are missing, but there are found such animals as the llamas and the vicuñas, which are relatives of the camel. Horses, cattle, sheep, and goats were not among the native animals of South America, but were introduced for economic purposes and exist in great numbers.

The tropical regions are a jungle paradise not only for wild animals, but for gorgeously plumed birds, including humming birds, flamingoes, toucans, aracarís, chatterers, and a great variety of parrots. The largest bird of prey in the world, the condor, is found in the Andes. In the tropical regions, insects also are very numerous, and include many species of large and brilliant-hued butterflies. The beetle family is also well represented, some species being much larger than those found in other regions. Chief among the reptiles are alligators, boas, rattlesnakes, and turtles. The rivers teem with fishes, and the number and variety of species found here are greater than in any other part of the world.

Mineral Resources. The rich deposits of gold and silver found in South America were exploited by the native tribes hundreds of years before the Spaniards and other white men came, who were also attracted to this land almost wholly because of this wealth. In Bolivia the Potosí silver mines alone had produced over \$1,500,000,000 by the first decade of the twentieth century. The gold deposits of Brazil at the height of their productiveness had an annual yield of over \$6,000,000, but to-day the output equals about half of that. Colombia, Venezuela, and Guiana also have considerable deposits of gold and silver. Other minerals which are found abundantly in South America are nitrate and guano, especially in the deserts of Northern Chile; borax and tin, in Bolivia; manganese, iron ore, mica, and diamonds, in Brazil; and platinum, emeralds, and copper, in Colombia. The petroleum production of Venezuela is exceeded only by that of the United States at present, and Colombia, Peru, and Argentina also are producing large quantities of oil. Coal and lignite are mined in Colombia, Venezuela, Brazil, Chile, and Peru.

Discovery, Exploration, and Settlement

During his third voyage of exploration, in 1498, Christopher Columbus explored the island of Trinidad and first touched the mainland at the mouth of the Orinoco. During his fourth voyage, from 1502 to 1504, he coasted along

the continent from the peninsula of Yucatan in Mexico to Venezuela. The next navigator to explore South America was Alonso de Ojeda, a Spaniard, who followed the coast from near the equator to Venezuela in 1499. He was accompanied by Americus Vesputius, who published the first account of the New World, and whose name was given to the two continents. In the early months of 1500, Pinzón sailed along the eastern coast into the mouth of the Amazon, and then continued south until he had reached 8° 20' south latitude. He was followed shortly by Cabral, who made claims to large areas in the name of Portugal.



ONE OF THE LARGEST CATARACTS IN THE WORLD

The Falls of Iguassú, at the junction of three republics, Brazil, Paraguay, and Argentina, where the Iguassú River joins the Paraná, rank among the most magnificent spectacles of the world. They are forty-six feet higher and some hundreds of feet wider than Niagara. Situated in the midst of virgin tropical forests, they make a remarkable impression on the tourist who is willing to endure the hardships and difficulty of reaching them from Buenos Aires, partly by rail, partly by steamer, and several days' journey on horseback.

Vesputius, also in behalf of Portugal, continued the explorations south as far as the Plata River, and all were more interested in overcoming this huge land obstacle, which blocked a direct route to India, than in the character and resources of this new continent, with all its unknown wealth. After Balboa, in 1513, had crossed the Isthmus of Panama and discovered the Pacific Ocean, Magellan, seven years later, rounded Cape Horn and at last found a water route to the East.

The interior of this vast continent began to interest the explorers after some of the essentials of the coast line were known. Francisco de Pizarro conquered Peru in 1531-1534, and his companion, Diego de Almagro, advanced farther south into Chile. Francisco de Orellana crossed the Andes and, following the course of the Amazon from its headwaters to its mouth, reached the Atlantic Ocean in 1541. While the Spaniards were exploring the continent from west to east, the Portuguese began in 1531 to push into the interior from east to west. They eventually occupied the vast region of Brazil. Spain and Portugal had almost entire control of the continent until the beginning of

OUTLINE AND QUESTIONS ON SOUTH AMERICA

Outline

I. Position and Size

- (1) Latitude and longitude (see map)
- (2) Relation to other continents
- (3) Greatest length, 4,800 miles
- (4) Greatest breadth, 3,300 miles
- (5) Area, 7,700,000 square miles
- (6) Comparative area

II. Shape and Coast Line

- (1) Roughly triangular—like North America
- (2) Regular coast line—like Africa
- (3) Few islands
- (4) Coast waters

III. Geographic Features

- (1) Resemblance of surface features to those of North America
- (2) Andes
 - (a) Chief peaks
- (3) Central plain
- (4) Highlands of Brazil
- (5) Rivers
 - (a) Amazon greatest in world
- (6) Lakes
- (7) Climate

IV. Vegetable and Animal Life

- (1) Characteristic vegetation
 - (a) Tropical forests
 - (b) Economically valuable forms
- (2) Animals
 - (a) Absence of powerful wild animals
 - (b) Forms peculiar to this continent

V. Minerals

- (1) Silver and gold
- (2) Other metals
- (3) Nitrate

VI. The Inhabitants

- (1) Native races
- (2) European immigration
- (3) Mestizos

VII. History

- (1) Discovery and conquest
- (2) Independence secured
- (3) Revolutions
- (4) Recent progress

Questions

Why is South America one of the first continents which the child in school is asked to draw?

What is the loftiest mountain peak on the continent? How does it compare with the loftiest of North America?

Why has South America a more equable climate than North America?

What white man first touched the mainland of the continent, and where?

How does the largest lake in South America compare in size with the smallest of the Great Lakes?

What mineral substance does one of the western desert regions produce, and for what is it used?

How does it happen that there is little or no color prejudice in South America?

What is the largest river system in the world? How long is the main river? What is the total length of navigable rivers in the system?

Name four common domestic animals of North America which are not native to this continent.

Is South America farther from the South Pole or nearer to it than Australia? How much?

Name two South American trees which yield important drugs. For what are they used?

How many of the continents are larger than South America? How many have a larger population?

What is the general character of the governments in South America?

What European countries long dominated this continent, and how is their influence still felt?

the nineteenth century. The Spanish colonies declared their independence, beginning in 1810, and established several republics after the model of the United States. After a protracted struggle, Spain formally recognized their independence in 1826. In 1823 Brazil became independent of Portugal and retained a monarchical form of government which lasted until 1889, when a republic was established.

For the greater part of the nineteenth century, these countries were disturbed by periodical internal revolutions, and their progress was in consequence slow. Since the beginning of the twentieth century, more stable political conditions have prevailed, and a great economic development is taking place as the vast natural resources of the continent are being opened up. South America is playing to-day an important part in the international trade of the world. The historical account of each country is given elsewhere in these volumes.

Related Subjects. Much additional information on various phases of South American geography may be gained from the following articles in these volumes. Almost all of the articles on the political divisions also contain lists, so that the range of reading indicated is wide.

Falkland	Tierra del Fuego
Galapagos	Trinidad

MOUNTAINS

Aconcagua	Cordillera
Andes	Cotopaxi
Chimborazo	

POLITICAL DIVISIONS

Argentina	Ecuador
Bolivia	French Guiana
Brazil	Paraguay
British Guiana	Peru
Chile	Uruguay
Colombia	Venezuela
Dutch Guiana	

Amazon	Magdalena
Madeira	Orinoco
Parana	Paraguay
Pilcomayo	Tapajos
Rio de la Plata	Uruguay
São Francisco	

UNCLASSIFIED

Inca	Llanos
Indians, American	Patagonia
(South American	Selvas
Types)	Titicaca, Lake

SOUTH AMERICAN SWITZERLAND, a term applied to Bolivia (which see).

SOUTH AUSTRALIA, an agricultural state of the Commonwealth of Australia, occupying 380,070 square miles in the south-central part of the continent and bordering on the Southern Ocean and the Great Australian Bight. It is a level or gently undulating plain, broken by several mountain ranges. The western plains are semi-arid and treeless, but the mountain slopes are heavily wooded with eucalyptus, sugar gum, and Indian cedar. The coast is deeply indented and penetrated by gulfs and bays. The largest of these are Spencer and

Saint Vincent's gulfs, separated by Yorke Peninsula. Eyria Peninsula lies between Spencer Gulf and the Great Australian Bight, on the west. The Gulf of Saint Vincent is

partly enclosed by Kangaroo Island, the longest island of Australia. There are few rivers, the only stream of importance being the Murray. The highlands are studded with shallow lakes which are numerous, but not permanent.

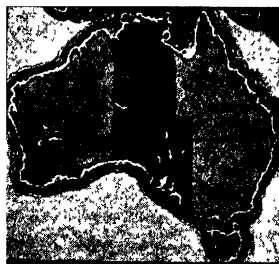
The climate, though hot, is healthful and pleasant, as the average humidity is low. Along the south coast, and in the highlands, there is sufficient rainfall for agricultural purposes, but in the interior the annual precipitation is only from five to eleven inches a year.

People and Education. The population was estimated at 578,000 in June, 1928. The larger part of the inhabitants are of British or Australian birth; other Europeans include Germans and Scandinavians, and there are also several hundred Chinese.

There is no State Church, and the Church of England, though the largest denomination, has proportionally a smaller following than in any of the other Australian states. A number of other sects are represented, including Roman Catholics, Methodists, Lutherans, Baptists, Presbyterians, Congregationalists, Church of Christ, and Salvation Army. There are also Jewish temples and Mohammedan and Confucian shrines.

Education is free, secular, and compulsory. Much attention has been given to agricultural and technical training. Tree-planting and nature study have been encouraged by the schools, and Arbor Day has been set aside as an annual holiday. There is a university at Adelaide, and also a state training school for teachers, a school of mines, and an agricultural college.

Industries. Pastoral lands are leased by the government for the grazing of livestock. South Australia, however, is less devoted to pastoral pursuits than the other large states of the Commonwealth, and miles of arid grasslands are being converted into vineyards, orchards, and orange groves, with the introduction of irrigation, water for which is furnished by



LOCATION MAP

South Australia is shown in solid black. Until 1911 the two shaded areas to the north were an undivided part of South Australia; in that year they were formed into Northern Territory. In 1927 Northern Territory was divided into two practically equal parts, and named North Australia and Central Australia.

artesian wells or by the Murray River. Vine culture, the propagation of citrus fruits, and the dried-fruit industry are important in these irrigated areas. Large crops of wheat, barley, oats, hay, and potatoes are raised in the south and east sections. Salt is obtained in great quantities from the shallow salt lakes. The eastern mountain ranges contain extensive deposits of iron ore, gypsum, phosphate rock, copper, gold, silver, and other minerals; the first gold of Australia was mined in this state. Manufactures are few and unimportant.

Transportation and Commerce. South Australia has 3,400 miles of state railway, including 600 miles of the Transcontinental Railroad built to connect Brisbane, on the east coast of Queensland, with Fremantle, on the west coast of the continent. The Murray River, navigable for 2,000 miles, is a busy highway of transportation. Adelaide, the capital, is a great shipping center. The exports include fresh and dried fruits, wine, meats, butter, wheat, flour, wool, and copper.

History and Government. Colonization in Australia was slow, and it was not until the first half of the nineteenth century that much progress was made. Matthew Flinders, the English navigator, made explorations and discoveries along the coast of the South Australian region in about 1802, and attracted some interest to this region in England. In 1830 another English explorer, Charles Stuart, sailed up the Murray River and made some important geographical discoveries and observations which came to the attention of Edward Gibbon Wakefield. The latter had a plan of colonization which he thought would result in the settling of new lands more readily than the old method of indiscriminately doling out large parcels of territory and forgetting about it. His idea was that persons who were willing to work and improve a new land should be allowed to own it. Others favored his scheme, and a certain George Angas was willing to advance funds for the project. In 1834 an act of Parliament sanctioned the plan, provided that it would involve no expense to the home government; another stipulation forbade the transportation of convicts.

Colonization began in 1836. During the first few years, over-expenditures for public buildings, speculation, and extravagance caused the colony to become insolvent. In 1841 the charter was revoked, and the settlement was made a crown colony. The discovery of valuable mineral deposits, and the excellent management of the new governor, Sir George Grey, again put the colony on a sound basis. In 1856 self-government was restored, and a constitution was framed which provided for a bicameral legislature. In 1901 South Australia joined the Commonwealth, to which, ten years later, it ceded Northern Territory. South

Australia is noted for its progressiveness in labor and social legislation, and the participation of the government in enterprises which are usually private undertakings.

The state governor, who is appointed by the king of England, is assisted by an executive council of six ministers and the chief justice of the supreme court. There is a parliament consisting of the legislative council and the house of assembly. The former consists of twenty members, elected for six years; the lower house is composed of forty-six members, elected for three years. There is universal suffrage, the vote having been extended to women in 1894. Electors voting for the members to the upper house must possess certain property qualifications. Justice is administered by the supreme, vice-admiralty, insolvency, circuit, and inferior courts.

Adelaide, the capital, is the third largest city in Australia. It was founded in 1836 and named after the queen of William IV of England. It is situated seven miles from the ocean, on the banks of the Torrens River, and is 508 miles northwest of Melbourne. The river, on the banks of which are beautiful parks, divides the city into North and South Adelaide, connected by handsome bridges. Famed as a residential city, Adelaide is one of the most beautiful in Australia, with broad, well-kept streets and many imposing buildings. Among these, the Houses of Parliament, the town hall, and the general postoffice are conspicuous. The city possesses a public library, a museum, a conservatory of music, and the University of Adelaide, founded in 1874. The climate, though excessively hot in the summer, is healthful. The city is governed by a mayor and six aldermen, and is the only Australian city in which the mayor is elected by the votes of all the taxpayers.

The principal industrial enterprises are plants for the manufacture of woolen, iron, and earthenware goods; tanneries, breweries, starch mills, and soap factories. An extensive trade is carried on with the interior and with foreign countries. Adelaide is the terminus of an extensive railroad system connecting it with Melbourne, Sydney, and Brisbane. The real commercial center is at Port Adelaide, on the coast, the port of call for all European steamers, and a flourishing town with about 29,000 inhabitants. The population of Adelaide, including suburbs, was 327,686 in 1927, over half the population of the state.

Related Subjects. The reader is referred in these volumes to the following articles:

Australia	Great Australian Bight
British Empire, and British	Murray River
Commonwealth of Nations	Northern Territory

SOUTHAMPTON, ENGLAND. See **ENGLAND** (The Cities).

SOUTH BEND, IND., an industrial city and county seat of Saint Joseph County. It is situated in the north-central part of the state, on the south bend of the Saint Joseph River, eighty-six miles southeast of Chicago. The city is an important commercial center, and is noted for the variety and extent of its manufactures. Population, 1928, 86,100 (Federal estimate).

South Bend occupies an area of over six square miles, and takes its name from the sharp bend in the Saint Joseph River. Concrete roads radiate in all directions from South Bend, and the Lincoln and Dixie highways intersect in the heart of the city. The largest park of the city park system is Erskine, which contains 120 acres. Other parks include Leeper, Potawatomi, Studebaker, Kaley, Howard, and Coquillard.

Transportation. Railroad lines entering the city are the Grand Trunk, the Michigan Central, the New York Central, the Pennsylvania, and the New Jersey, Indiana & Illinois (Wabash). Three inter-urban lines connect the city with Chicago and points in Indiana and Michigan. The place is also a motor-bus terminal for Northern Indiana.

Industries. South Bend, while primarily an industrial city, is surrounded by a fertile farming country, where dairying, grain-raising, and gardening and trucking are carried on extensively. It is in the small-fruit district of Northern Indiana and Southern Michigan, and is the center of one of the greatest peppermint-growing districts in the world. Two companies of international repute have their factories in South Bend—the Studebaker Corporation, which

manufactures automobiles, and the Oliver Chilled Plow Works. In addition, there are manufactories of men's wear, watches, artificial bait and rods, modern toys, lathes, four-wheel brakes, varnishes and paints, street-lighting equipment, hats and caps, unionalls, sewing machines, and woolen-mill products.

Institutions. The Northern Indiana Historical Society Museum, one of the finest in the state, is located on South Lafayette Boulevard. Saint Mary's Academy for girls and the University of Notre Dame are located about two miles north of the city, having their own postoffice, designated as Notre Dame, Ind.

History. The site of South Bend was once occupied by a Miami Indian village, and later was the home of the Potawatomi tribe. The place was visited by French trappers and missionaries, and in 1824 a fort was established by Alexis Coquillard. The town was incorporated in 1835, and became a city in 1865. South Bend has a zoning law. G.F.

SOUTH BEVELAND, an island in the estuary of the Scheldt River, forming a part of the Dutch province of Zeeland. See **NETHERLANDS, THE (The Country)**.

SOUTHBRIDGE, MASS. See **MASSACHUSETTS (back of map)**.



SOUTH CAROLINA is a state where the music of the mocking birds and cardinals mingles with the fragrance and the color of azaleas, camellias, honeysuckle, and jasmine. From the high forested mountains of the north to the lonely salt marshes on the sea, from the barren pine lands to the dark, moss-draped rivers, nature has made South Carolina a land of beauty. Smallest of the Southern states, it is one of the thirteen original members of the Union. It has always been distinguished for its aggressive and important part in United States history at critical times, and always has been true to its motto—"Ready in soul and resource." The state belongs to the South Atlantic group, and is known as **THE PALMETTO STATE**. The yellow jasmine became the state flower in 1924.

Size and Location. South Carolina covers a triangular area of 30,989 square miles, of which 494 square miles are water. It is about seven times the size of the state of Connecticut, and ranks thirty-ninth in area among the states. The Atlantic Ocean forms its eastern boundary. North Carolina lies to the north and northeast, Georgia to the west and south.

People. With the exception of Mississippi, South Carolina has been until recently the only state in the Union in which the colored population has exceeded the white. In 1920 the total number of inhabitants was 1,683,724; of these 864,719 were negroes, or 51.4 per cent. Since the boll-weevil scourge of 1921-1922, however, and its attendant negro migration to the North, this percentage has been lessened, and a state estimate (1925) showed more whites than negroes. Only 0.4 per cent of the total population is foreign-born. Russia and Germany have the largest representation. South Carolina developed two types in early colonial days—the aristocratic plantation-owner, whose need for many slaves colored South Carolina's history during the War of Secession and after; and the industrious small farmers, Scotch-Irish, French, Welsh, and others of English colonial stock, who inhabited the "up country"—that region back of the fall line. Over four-fifths of the population, or 82.5 per cent, live on farms and plantations or in rural villages. Charleston is the only city having a population of over 50,000 within the city limits. Other large cities are Columbia

(the capital), Greenville, Spartanburg, Florence, Anderson, and Sumter. The surrounding suburbs and mill villages give such cities as these much larger populations than the census figures show.

For over a century after settlement, the Anglicans were the dominant element on the coast. The Presbyterians were the most influential denomination in the up country until after the Revolution. To-day, however, the Baptists and Methodists claim the majority of the people.

Education. The predominance of the negro population has presented great difficulties in the matter of organizing an efficient educational system, and the illiteracy in the state is greater than in any of the other commonwealths but Louisiana. However, the fact that illiteracy decreased from 35.9 per cent in 1900 to 18.1 per cent in 1920 shows that these problems are being handled successfully; 88.1 per cent of the white and 71 per cent of the colored children of school age were in school in 1925-1926.

The present school system was established in 1868, but it was not until 1878, after the reconstruction period following the War of Secession, that any unified effort was made to establish a comprehensive public-school system. The high schools were not organized until 1907. Public education is administered by a state board of education, county boards, and local district officials. School attendance was not compulsory until 1919, but for some years there had been a law prohibiting the employment of illiterate children in factories and mines. Separate schools are provided for all colored pupils. The white one-teacher schools are being rapidly consolidated. School trucks, operated at public expense, make these consolidated schools accessible.

There are numerous institutions of higher education. Among those for women are Anderson College (Baptist), at Anderson; Chicora College, at Columbia, a Southern Presbyterian institution; Coker College (Baptist), at Hartsville; Columbia College (Methodist), at Columbia; Converse College, at Spartanburg, a non-denominational Christian college; Greenville Woman's College (Baptist); Lander College (Methodist), at Greenwood, formerly located at Williamston; Limestone College (Baptist), at Gaffney, one of the oldest colleges for women in the South; the Woman's College of Due West, controlled by the Associate Reformed Presbyterian Church.

Colleges for men are the Presbyterian College of South Carolina, at Clinton, and Wofford College (Methodist), at Spartanburg. Coeducational institutions are the College of Charleston, the oldest municipal college in America; Erskine College, at Due West, under control of the Associate Reformed Presby-

terians; Furman University, a Baptist college at Greenville; and Newberry College, a Lutheran college at Newberry.

Colleges for colored students are Morris College, at Sumter, and Benedict College, Columbia, both Baptist institutions; Allen University, at Columbia, under the African Methodist Episcopal Church; and Claflin College, at Orangeburg (Methodist Episcopal).

Institutions under state control are described below.

The Citadel, the military college of South Carolina, at Charleston, was established by the state in 1842. Military work is prescribed by the War Department, and cadets are eligible upon graduation to the officers' reserve corps of the United States army.

Clemson College, chartered at Clemson in 1889, is situated upon the old homestead of John C. Calhoun. It is the state agricultural and mechanical college for men. The state agricultural experiment station is a department of the college. Besides four-year courses in agriculture and engineering, there are short courses in agriculture and textile engineering.

Medical College of South Carolina, at Charleston, is one of the oldest medical colleges in the country, and has a very fine pathological museum. It is coeducational, and is owned and supported by the state.

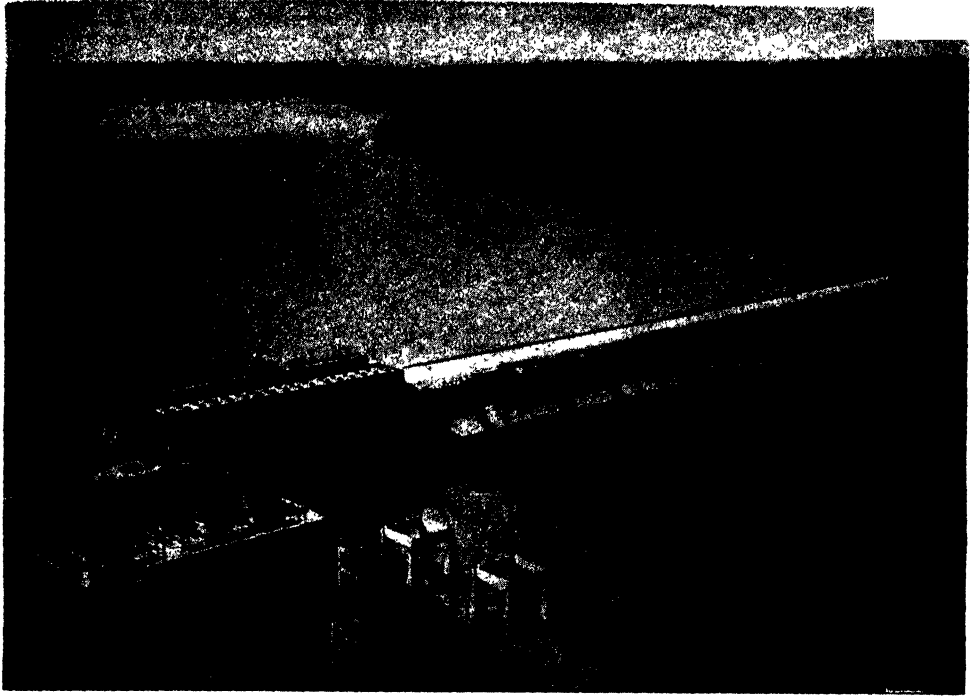
South Carolina School for the Blind and Deaf, near Spartanburg, was founded in 1849 by the Reverend N. P. Walker. In 1855 it was taken over by the state, but members of the Walker family have been connected with the school during its entire career. Students are taught from the primary grades through high school. There are separate buildings and teachers for colored pupils.

State College, at Orangeburg, was opened by the state in 1896. It is a coeducational college for negroes. Training is given in agricultural and industrial work. State extension work among the negroes is handled by State College, in cooperation with Clemson College.

University of South Carolina, a coeducational state institution located at Columbia. It was chartered by the general assembly in 1801, and opened in 1805 as South Carolina College. It prospered until the time of the War of Secession, when its halls were used, first by the Confederates, then by the Union army, as a hospital. After the war, the school was reopened as the University of South Carolina, but was forced to close until after the period of readjustment. In 1887 it was reorganized, and since 1894 has been coeducational. Besides the College of Arts and Science, there are schools of education, commerce, journalism, law, engineering, pharmacy, and graduate work. Special attention given to work in biology, chemistry, and rural fields has been of value in the development of the state.

Winthrop College, at Rock Hill, is a college for women, founded in 1886. In 1891 it became a state institution. Besides a regular collegiate course, normal and industrial courses are given. Demonstration work in home economics is done by the college for the state.

Charities and Corrections. The state board of charities and corrections, created in 1915, was reorganized in 1920 as the board of public welfare. The public institutions for the de-



"WHITE COAL" IN SOUTH CAROLINA

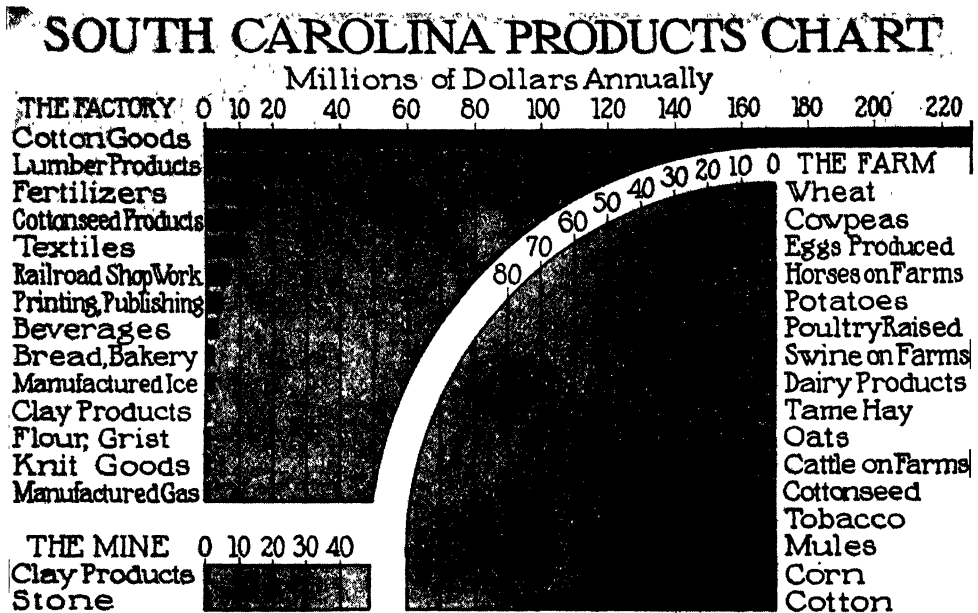
A significant development in the industrial history of the state is the increasing use of water power. The great dam shown above is near Waterbury.

pendent, defective, and delinquent include an asylum for the insane, a Confederate infirmary, a reformatory for negro boys, an industrial school for girls, Fairwold Industrial School for negro girls, and a penitentiary, all at Columbia; an industrial school at Florence; an institution for the deaf, dumb, and blind at Cedar Springs. There is a state tuberculosis sanitarium, but it is not a charitable institution. In 1913 contract labor was abolished in the penitentiary. There has been notable legislation within recent years advancing the cause of education, health conditions, industry, and the care of soldiers returned from the war. The state board of health, organized in 1879, has done excellent work in the health education of the negro, in lowering the rate of infant mortality, and in reducing deaths from hookworm, malaria, and typhoid fever.

The Land. South Carolina is for the most part in the Coastal Plain and Piedmont Plateau regions, extending into the Blue Ridge Mountains in the northwest. For sixty miles southwest of the North Carolina border, the Coastal Plain is a smooth, hard sand beach, becoming broken farther south by winding tropical creeks, and fringed with low, sandy islands, salt marshes, and swamps. This region, known locally as the "low country," was under the

ocean in recent geological times, the old shore line being still traceable through Columbia and Camden. Along the southern coast there are dense groves of palmettos and magnolias. The vast marshes of reeds or of live oaks, gum trees, and cypress, draped with moss and interwoven with vines, meet a sandy region to the west known as the *Pine Barrens*, sand hills of dune origin, but now fixed and covered with pines. The sand hills rise gradually to the broken valleys and wooded uplands of the fall line, which marks the boundary between the Coastal Plain and the Piedmont Plateau. This line passes southwest through the state, and it is here that the east-flowing rivers fall from the crystalline rocks of the plateau to the soft rocks of the plain.

The Piedmont Plateau, the western section of the state, rises abruptly above the Coastal Plain, its forest-clad ridges reaching an elevation of 1,000 feet in the northwest, where they meet the wooded foothills of the Blue Ridge Mountains. The state's loftiest peaks, Sassafras Mountain (3,548 feet), Mount Pinnacle, Caesar's Head, and many other peaks rising between 2,000 and 3,000 feet, are in the northwest corner, where the Blue Ridge Mountains form the boundary with North Carolina. This region is the summer resort of the state.



Figures are from Federal and state sources, and present averages for three years.

Rivers. The eastern portion is drained by the Great Pedee (also spelled Peedee), which is fed by the Little Pedee, Waccamaw, and Lynches rivers, and empties into Winyah Bay at Georgetown. The Santee, the largest river, is fed by the Wateree, Broad, Saluda, and Congaree rivers. The Savannah forms the entire southwest boundary with Georgia. The main sources of these rivers are in the mountains, but the Edisto has its whole course in the Coastal Plain. In the Piedmont, the current of the rivers is swift, affording a vast amount of water power. At the fall line, on the edge of the plateau, they pass by short stretches of shoals to the Coastal Plain, where they become sluggish. The tides push up their channels for fifteen to thirty miles, and overflow the surrounding fields.

Climate. The mild climate of South Carolina resembles that of Southern Greece and

Italy. Although it is almost tropical in the south, and the swamps are unhealthful, the uplands and mountain region are especially healthful and delightful. The average temperature for January is 45°, and for July 80°. Along the coast the climate is more equable than in the interior. In the northern mountains, temperatures below zero have been recorded, and at Charleston the mercury sometimes rises to 104°. The annual rainfall, averaging forty-eight inches, is heaviest during the summer months, but it is fairly evenly distributed throughout the state. Snow occasionally covers the mountains and uplands, but in the south and east sections, it is rarely seen. The coast frequently is swept by severe hurricanes originating in the West Indies, which damage shipping and destroy vegetation, while the western part of the state is sometimes visited by tornadoes.

Sources of the State's Wealth

Agriculture. The climate and soil of South Carolina are suitable for all plants of the subtropical and temperate zones, and much of the state is farm land. Perhaps the very climate and the ease with which crops grow have been disadvantageous to the farmers. The state has suffered in the past from inefficient agricultural methods, and from its farmers thinking in terms of one "cash crop"—cotton. On the small farms, enough corn and vegetables were raised to supply family needs, and enough cotton was planted to carry a bale or two to

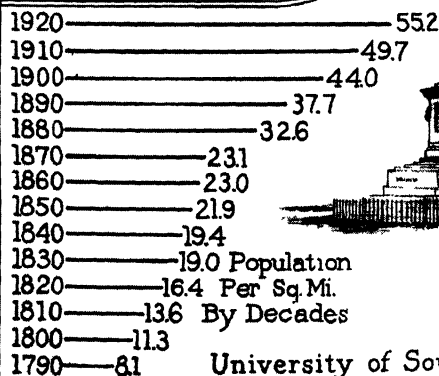
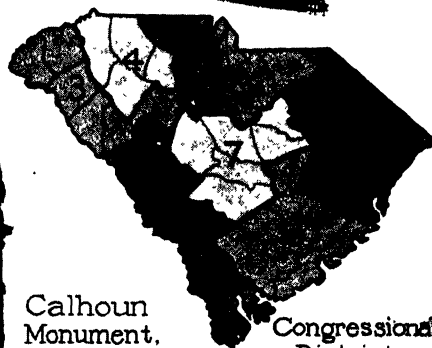
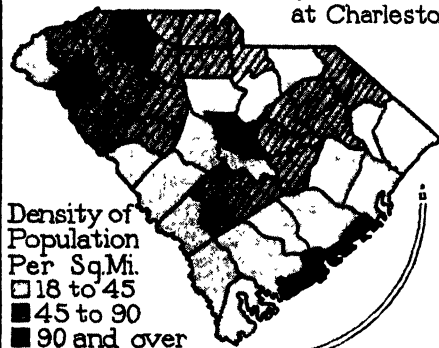
town for "cash," or its equivalent in clothes or tools, or food not raised on the farm. To the small farmer the difference of just a few cents a pound in the cotton market often meant the difference between having a little money to spend or none at all. Frequently, the negro farmer was from year to year in debt to the storekeepers, because the "cash crop" failed to meet his small outlay for the year.

Between 1917 and 1921, the spread of the boll weevil over the state awakened the cotton-growers to the evils of the single crop, and to

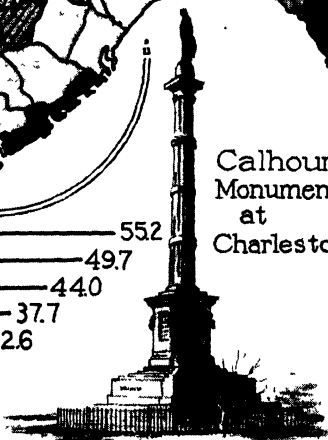
SOUTH CAROLINA



Custom House,
at Charleston



Calhoun
Monument,
at
Charleston



University of South Carolina, Columbia



the economic disadvantage of "absentee landlordism." Intelligent supervision and scientific management are necessary to-day to meet the test of growing high-grade cotton; no longer can the job be left to shiftless tenants or careless overseers. The state is teaching the farmer the substitution of diversified crops; and the general farm, with dairy cattle, some hogs, poultry, and bees, and several crops instead of one, is replacing the old farm where, formerly, cotton and corn grew as and if it would. South Carolina is not only manufacturing fertilizer, but learning the use of it, not planting more acreage, but raising more and better crops to the acre.

Cotton is still the crop of first importance in acreage, but already the value of cereal and vegetable crops is almost equaling that of cotton. Corn holds second place in acreage, but tobacco is considered the second "cash crop" of the state. Oats, wheat, and rye are important cereal crops. Rice, which in the early part of the last century was the principal crop, and in which the state outranked all others in the Union, has decreased in importance from sixty-four per cent of the total production of the United States, in 1859, to a little more than one-third of one per cent in 1920. This was due to large increase in production elsewhere, and to the topographical impossibility of controlling storm and flood conditions.

Sweet potatoes and white potatoes are raised extensively, and truck farming is important in the Coastal Plain. South Carolina ranks among the first five asparagus-producing states. Peaches, apples, pears, cherries, and a few apricots and quinces are cultivated in the uplands, and figs, pecans, a small number of oranges, and other tropical fruits, are grown in the southeastern section. Persimmons, plums, and grapes grow wild in great profusion.

The Standard Coöperative Marketing Act of 1921 aids the farmer in obtaining better prices, and the state is coöperating with the farmer by teaching him better ways of handling his crop and packing it for sale.

Forests. About one-fourth of the area of the state is woodland, made up quite largely of second-growth yellow pine, cypress, and hardwoods. Lumber and timber products are South Carolina's second most important industry; yet, with greater power development, more factories should arise to utilize the raw material now being shipped out to the factories of other states. Some turpentine is produced, though not as much as formerly.

Fisheries. The numerous bays and salt-water creeks of the coast contain extensive oyster beds, and oysters are the most important sea product of the state. Whiting, shad, sea bass, sturgeon, shrimp, crabs, and many other fish are abundant in these tidal waters,

and some pike, perch, catfish, and trout are caught in the inland streams. Through the board of fisheries, the state is encouraging commercial fisheries, but this industry is still in its infancy.

Mining. While South Carolina is preëminently an agricultural state, it yields, in the Piedmont section, stone, clay and clay products, barite, mica, and a little gold and silver. In the Coastal Plain area are sand, gravel, clay, marl, and the raw materials for making cement. Phosphate rock, formerly mined in large quantities, is no longer produced; Florida and Tennessee now furnish the greatest part of the phosphate rock for the country.

The clay yielded by South Carolina is chiefly of two kinds—that used for common brick, and the "paper clay" used in the manufacture of paper. In the Aiken area is to be found one of the largest and purest sedimentary kaolin deposits in the United States. South Carolina usually ranks third in production and second in value of kaolin produced in the United States. Talc, limestone, marble, manganese, bismuth, graphite, monazite, fuller's earth, and brown coal are found, but are not commercially important. The quarrying of granite has increased greatly since 1917.

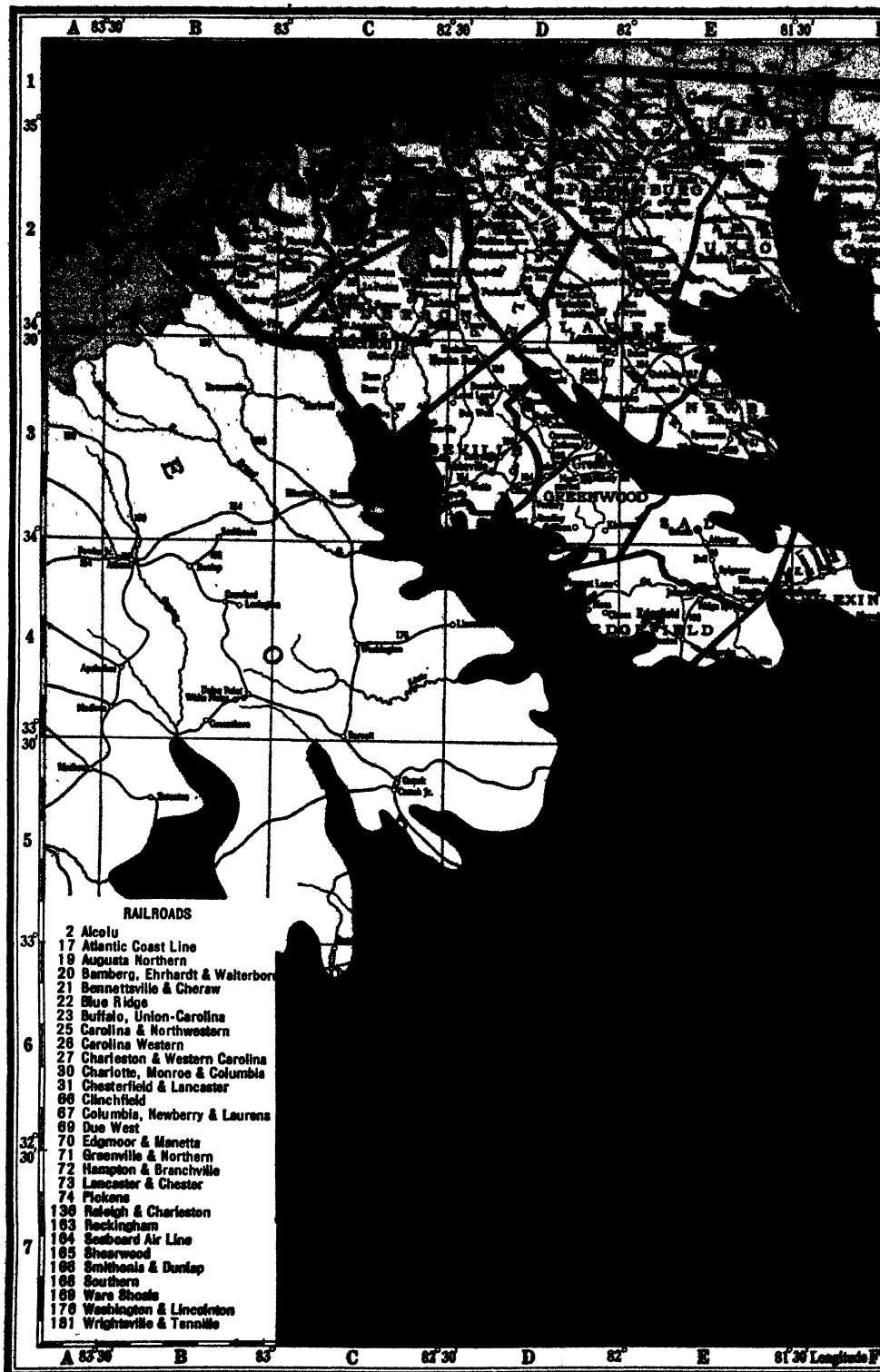
Manufactures. South Carolina's manufactures are developing rapidly, especially those related to agricultural pursuits. The abundant hydroelectric power afforded by the rivers in the Piedmont and along the fall line has stimulated the development of industry because of its cheapness, and because of its many advantages for the small industry. The construction of the immense Murray Dam near Columbia, and other developments, will add enormously to the power available for manufactures. To-day, South Carolina ranks high among the states in hydroelectric development, and the system, which joins forces with that of North Carolina, is one of great potential possibilities, equal to the demands of a growing, progressive section of the country.

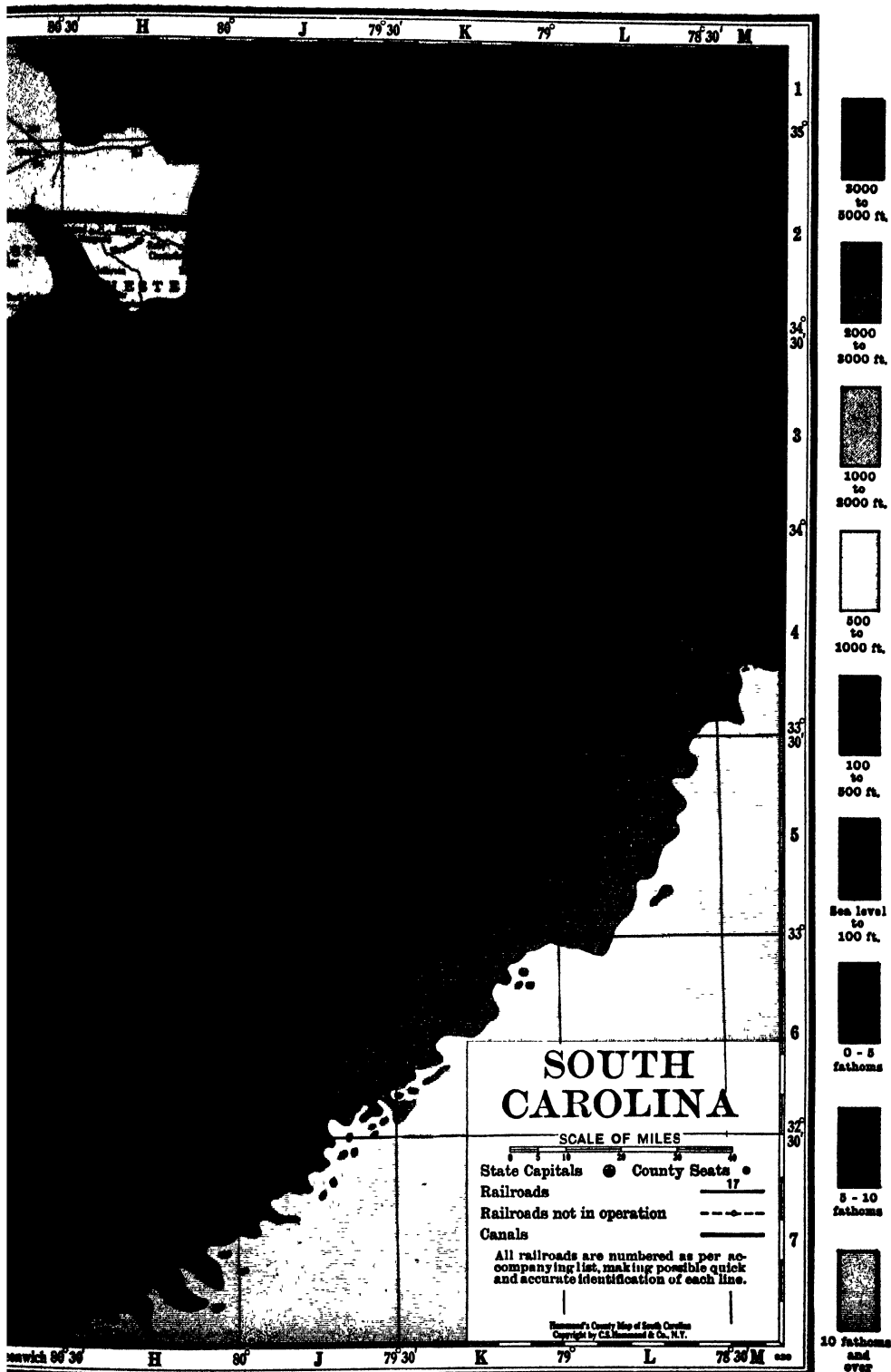
The predominant manufacturing interest is the weaving of cotton goods, in which South Carolina ranks third among the states, being surpassed only by Massachusetts and North Carolina. The value of cotton goods is over sixty per cent of the total value of the manufactures of the state. Lumber and timber products are second in importance, and fertilizers are third. Cottonseed oil was first manufactured in America in Columbia, S. C., in 1826. There are over 1,134 manufacturing establishments. Canning of fruits and vegetables is a young and growing industry.

Much of the labor is supplied by mountain families who were induced to migrate to the lower levels for mill wages and better living conditions. An industrial development peculiar to the Southern cotton-mill states is the build-

SOUTH CAROLINA

Abbeville, (D3).....	4,570	Coronaca, (D3).....	165	Heath Springs, (G2).....	505	Martin, (F5).....	100	Richburg, (F2).....	222
Adamsburg, (E2).....	100	Cottageville, (H6).....	444	Helena, (E3).....	435	Martins Point, (H6).....	150	Ridgeland, (G7).....	418
Alcan Run, (H6).....	150	Coward, (J4).....	350	Hemingway, (J4).....	371	Maryville, (J6).....	505	Ridge Spring, (E4).....	597
Alcan, (E4).....	4,103	Cowpens, (E1).....	1,284	Hendersonville, (G6).....	285	Mauldin, (D2).....	100	Ridgeville, (H5).....	385
Alcolu, (H4).....	300	Crocketville, (F6).....	100	Hickory Grove, (F2).....	301	May, (K3).....	200	Ridgeway, (G3).....	429
Allen, (L4).....	200	Cross, (H5).....	150	Hilda, (F5).....	200	Mayesville, (H4).....	839	Rimini, (H4).....	100
Allendale, (F5).....	1,893	Cross Anchor, (E2).....	200	Hiltonhead, (G7).....	100	Mayo, (E1).....	150	Rion, (F3).....	100
Almeda, (F6).....	100	Cross Hill, (E3).....	587	Hodges, (D3).....	284	Mcgett, (H6).....	1,000	Rock Hill, (F2).....	8,809
Alston, (F3).....	100	Dale, (G6).....	100	Holly Hill, (H5).....	522	Meriwether, (D4).....	100	Rockton, (F3).....	100
Anderson, (C3).....	10,570	Dalzell, (H3).....	150	Hopkins, (D3).....	1,900	Meyers Mill, (E5).....	150	Rodman, (F2).....	100
Andrews, (K5).....	1,968	Darlington, (J3).....	4,669	Huger, (J5).....	150	Middendorf, (H2).....	150	Round O, (G6).....	250
Antreville, (C3).....	150	Denmark, (F5).....	1,254	Hyman, (J4).....	200	Midland Park, (H6).....	100	Rowesville, (G5).....	425
Appleton, (F5).....	234	Dillon, (K3).....	2,205	Inman, (D1).....	310	Millettville, (E5).....	250	Ruby, (H2).....	290
Arcadia, (E2).....	300	Donalds, (D3).....	310	Irmo, (F3).....	694	Minturn, (K2).....	100	Ruffin, (G5).....	138
Arden, (F3).....	924	Dorchester, (H5).....	150	Iva, (C3).....	962	Moncks Corner, (H5).....	309	Saint Charles, (H3).....	150
Arkwright, (D2).....	100	Dovesville, (J3).....	181	Jackson, (E5).....	100	Monetta, (E4).....	137	Saint George, (G5).....	1,386
Awendaw, (J5).....	100	Drake, (J3).....	100	Jacksonboro, (H6).....	150	Monticello, (F3).....	100	Saint Matthews, (G4).....	1,780
Aynor, (K4).....	275	Drayton, (E1).....	200	James Island, (H6).....	500	Montmorenci, (E4).....	200	Saint Stephen, (J5).....	312
Baldock, (F5).....	100	Due West, (D3).....	702	Jamestown, (J5).....	300	Moore, (E2).....	300	Salem, (C2).....	250
Bamberg, (F5).....	2,210	Dunbar, (J2).....	100	Jamison, (G4).....	100	Moultrieville, (J6).....	500	Salley, (F4).....	400
Barnwell, (F5).....	1,903	Dunbarton, (E5).....	187	Jedburg, (H5).....	100	Mount Carmel, (D3).....	228	Salters Depot, (J4).....	300
Barton, (F6).....	150	Duncan, (D2).....	115	Jefferson, (H2).....	454	Mount Croghan, (H2).....	232	Saluda, (E3).....	1,203
Batesburg, (F4).....	2,848	Early Branch, (G6).....	356	Jenkinsville, (F3).....	100	Mount Pleasant, (J6).....	1,575	Samaria, (F4).....	100
Bath, (E5).....	300	Easley, (C2).....	3,568	Johns Island, (H6).....	500	Mountville, (E3).....	220	Sandy Springs, (C2).....	150
Beaufort, (G7).....	2,831	Eastover, (F4).....	326	Johnsonville, (K4).....	271	Mullins, (K3).....	2,379	Santuck, (E2).....	100
Beech Island, (E5).....	150	Eau Claire, (F3).....	2,566	Johnston, (E4).....	1,101	Murrells Inlet, (L4).....	300	Sardinia, (H4).....	100
Belton, (C2).....	1,780	Ebenezer, Florence Co., (J3).....	400	Jonesville, (E2).....	1,209	Myers, (J6).....	350	Scotia, (F6).....	269
Bennettsville, (J2).....	3,197	Ebenezer, York Co., (F2).....	298	Jordan, (H4).....	300	Myrtle Beach, (L4).....	300	Scranton, (J4).....	294
Benneth, (H3).....	299	Edgefield, (E4).....	1,865	Kathwood, (E5).....	150	Navy Yard, (J6).....	850	Severn, (F4).....	150
Bingham, (K3).....	143	Edgemoor, (F2).....	122	Kelton, (E2).....	56	Neeses, (F4).....	289	Sellers, (K3).....	483
Bishopville, (H3).....	2,090	Edisto Island, (H6).....	3,500	Kershaw, (G2).....	1,022	Nesmith, (J4).....	150	Seneca, (C2).....	1,460
Blacksburg, (F1).....	1,512	Efingham, (J3).....	300	Killian, (G3).....	100	Newberry, (E3).....	5,894	Sharon, (F2).....	419
Blackstock, (F2).....	206	Ehrhardt, (F3).....	495	Kinards, (E3).....	236	New Brookland, (F4).....	100	Sheldon, (G6).....	150
Blackville, (F5).....	1,421	Elko, (F3).....	188	Kingsburg, (J4).....	200	Newmarket, (D3).....	100	Shelton, (F3).....	100
Blairs, (F3).....	150	Ellenton, (E5).....	385	Kings Creek, (F1).....	100	Newport, (F2).....	100	Sieglingville, (F5).....	153
Blaney, (G3).....	156	Ellot, (H3).....	271	Kirksey, (D3).....	200	Newry, (C2).....	900	Silver, (H4).....	100
Blenheim, (J3).....	234	Elloree, (G4).....	925	Kline, (F6).....	238	New Zion, (J4).....	150	Silverstreet, (E3).....	297
Bluffton, (G7).....	480	Enoree, (E2).....	1,800	Kollock, (J2).....	100	Nichols, (K3).....	191	Simpsonville, (D2).....	566
Blythewood, (G3).....	250	Enstille, (F6).....	1,393	Lake City, (J4).....	1,606	Ninety Six, (D3).....	773	Sixmile, (C2).....	134
Bonneau, (J5).....	350	Eureka, (E4).....	200	Lake View, (K3).....	330	Norris, (C2).....	206	Smalls, (F1).....	101
Bordeaux, (D4).....	200	Euclid, (H5).....	285	Lamar, (H3).....	784	North Augusta, (E4).....	700	Smyrna, (F5).....	137
Bowling Green, (F1).....	100	Fairfax, (F4).....	957	Lancaster, (G2).....	3,032	North Charleston, (H6).....	500	Society Hill, (J3).....	500
Bowman, (G5).....	733	Fairforest, (D2).....	300	Lando, (F2).....	100	Starr, (C3).....	1,742	Spartanburg, (D1).....	22,638
Bowyer, (H5).....	87	Fairmont, (D2).....	100	Landrum, (D1).....	980	Steedman, (F4).....	150	Springfield, (F4).....	798
Bradley, (D3).....	207	Fair Play, (B2).....	100	Lane, (J4).....	308	Stokes, (G6).....	150	Starr, (C3).....	347
Branchville, (G5).....	1,814	Ferguson, (H5).....	100	Langley, (F4).....	1,400	Strawberry, (H5).....	150	Steedman, (F4).....	150
Brookland, (F4).....	1,793	Filbert, (F1).....	250	Latta, (K3).....	1,079	Strother, (F3).....	150	Stokes, (G6).....	150
Brunson, (F6).....	699	Fingerville, (E1).....	100	Laurens, (D2).....	4,629	Summerton, (H4).....	957	Strother, (F3).....	150
Buffalo, (E2).....	1,200	Florence, (J3).....	10,968	Leeds, (F2).....	100	Summersville, (H5).....	2,550	Strawberry, (H5).....	150
Bullock Creek, (F2).....	100	Floyd Dale, (K3).....	150	Leesville, (F4).....	1,216	Summit, (F4).....	89	Strawberry, (H5).....	150
Burton, (G7).....	100	Folly Beach, (J6).....	100	Leo, (J4).....	100	Sumter, (H4).....	9,508	Strawberry, (H5).....	150
Cades, (J4).....	250	Foreston, (H4).....	115	Levy, (F7).....	200	Swansea, (F4).....	690	Strawberry, (H5).....	150
Calhoun, (C2).....	450	Fork, (K3).....	134	Lewisdale, (F4).....	226	Switzer, (D2).....	150	Strawberry, (H5).....	150
Calhoun Falls, (C3).....	897	Forkshoals, (D2).....	100	Lexington, (F4).....	894	Sycamore, (F5).....	113	Strawberry, (H5).....	150
Callison, (D3).....	100	Fort Lawn, (G2).....	231	Liberty, (C2).....	1,705	Tarboro, (F6).....	100	Strawberry, (H5).....	150
Camden, (G3).....	3,930	Fort Mill, (G2).....	1,946	Liberty Hill, (G3).....	200	Tatums, (J2).....	176	Strawberry, (H5).....	150
Cameron, (G4).....	524	Fort Motte, (G4).....	464	Lincolnville, (H5).....	247	Taylor, (D2).....	250	Strawberry, (H5).....	150
Campobello, (D1).....	309	Fountain Inn, (D2).....	1,100	Little Mountain, (E3).....	399	Tillman, (F7).....	452	Strawberry, (H5).....	150
Carlisle, (F2).....	376	Fountain, (G7).....	100	Little River, (L4).....	150	Timmonsville, (J3).....	1,860	Strawberry, (H5).....	150
Cartersville, (J3).....	286	Franklin, (F6).....	296	Little Rock, (K3).....	197	Tindal, (H4).....	100	Strawberry, (H5).....	150
Cassatt, (H3).....	150	Gable, (H4).....	150	Livingston, (F4).....	159	Tirzah, (F1).....	160	Strawberry, (H5).....	150
Catawba, (G2).....	250	Gadsden, (G4).....	1,505	Lockhart, (F2).....	1,000	Toney Creek, (D2).....	100	Strawberry, (H5).....	150
Catechee, (C2).....	300	Gaffney, (E1).....	5,065	Lodge, (G5).....	315	Townville, (C2).....	257	Strawberry, (H5).....	150
Cayce, (F4).....	746	Garnett, (F6).....	200	Lonestar, (G4).....	150	Travellers Rest, (D2).....	500	Strawberry, (H5).....	150
Centenary, (K3).....	150	Gaston, (F4).....	100	Loris, (L3).....	600	Trenton, (E4).....	271	Strawberry, (H5).....	150
Central, (C2).....	898	Georgetown, (K5).....	4,579	Lowndesville, (C3).....	271	Trio, (J5).....	149	Strawberry, (H5).....	150
Chapin, (F3).....	264	Gilbert, (F4).....	226	Lowrys, (F2).....	194	Troy, (D4).....	315	Strawberry, (H5).....	150
Chappells, (E3).....	207	Glendale, (E2).....	750	Lucknow, (H3).....	200	Tucupau, (D2).....	800	Strawberry, (H5).....	150
Charleston, (J6).....	67,957	Glenn Springs, (E2).....	171	Lugoff, (G3).....	200	Turbeville, (H4).....	200	Strawberry, (H5).....	150
Cheraw, (J2).....	3,150	Goldville, (E5).....	150	Lumber, (J3).....	300	Umers, (F5).....	186	Strawberry, (H5).....	150
Cherokee, (E1).....	200	Gourdin, (J3).....	124	Luray, (F6).....	174	Union, (E2).....	6,141	Strawberry, (H5).....	150
Chesnee, (F1).....	600	Govan, (F5).....	100	Lydia, (H3).....	268	Vance, (H5).....	124	Strawberry, (H5).....	150
Chester, (F2).....	5,557	Gramling, (D1).....	100	Lykesland, (G4).....	150	Van Wyck, (G2).....	100	Strawberry, (H5).....	150
Chesterfield, (H2).....	856	Graniteville, (E4).....	2,500	Lyman, (D2).....	1,000	Varnville, (F6).....	1,160	Strawberry, (H5).....	150
Clarks Hill, (D4).....	100	Gray Court, (D2).....	318	Lynchburg, (H3).....	506	Vaulse, (E4).....	850	Strawberry, (H5).....	150
Clemson College, (C2).....	300	Great Falls, (G2).....	3,000	McCabe, (H3).....	417	Verdery, (D3).....	200	Strawberry, (H5).....	150
Clifton, (E2).....	4,500	Greelyville, (J4).....	645	McClellanville, (K5).....	850	Wagner, (F4).....	597	Strawberry, (H5).....	150
Clinton, (E3).....	3,767	Green Pond, (G6).....	200	McColl, (J2).....	2,129	Walhalla, (B2).....	2,068	Strawberry, (H5).....	150
Clio, (J2).....	1,009	Greenville, (D2).....	23,127	McConnellville, (F2).....	247	Waterboro, (G6).....	1,853	Strawberry, (H5).....	150
Clover, (F1).....	1,608	Greer, (D2).....	2,292	McCormick, (D4).....	1,284	Wampee, (L4).....	300	Strawberry, (H5).....	150
Cokesbury, (D3).....	300	Gresham, (K4).....	250	Macbeth, (J5).....	100	Wando, (J6).....	200	Strawberry, (H5).....	150
Colliers, (D4).....	150	Gurley, (L3).....	100	Maddens, (D2).....	100	Ward, (E4).....	234	Strawberry, (H5).....	150
COLUMBIA, (G3).....	37,524	Hagood, (G3).....	100	Mallory, (J3).....	61	Ware Shoals, (D3).....	1,500	Strawberry, (H5).....	150
Conestee, (D2).....	150	Hamburg, (E5).....	500	Manning, (H4).....	2,022	Warrenville, (E4).....	600	Strawberry, (H5).....	150
Congaree, (G4).....	150	Hamer, (K3).....	250	Marietta, (D1).....	200	Wateree, (G4).....	100	Strawberry, (H5).....	150
Converse, (E2).....	1,000	Hampton, (F6).....	706	Marion, (K3).....	3,892	Waterloo, (D3).....	209	Strawberry, (H5).....	150
Conway, (K4).....	1,969	Hardeeville, (G7).....	413	Marlboro, (J2).....	100	Waverly Mills, (K5).....	250	Strawberry, (H5).....	150
Coosawhatie, (F6).....	150	Hartsville, (H5).....	353	Mars Bluff, (J3).....	200	Wedgfield, (H4).....	250	Strawberry, (H5).....	150
Cope, (G5).....	266	Hartsville, (H5).....	3,624			Wellford, (D2).....	180	Strawberry, (H5).....	150
Cordesville, (J5).....	150							Strawberry, (H5).....	150
Cordova, (G3).....	133							Strawberry, (H5).....	150





SOUTH CAROLINA *Continued*

Greenville, (D2) 869	White Pond, (F5). 100	Williamston, (C2). 2,322	Winnsboro, (F3). 1,822	Yemassee, (G6)... 323
Minster, (B2) 1,847	White Rock, (F3) ..	Willington, (D4).. 272	Woodford, (F4).. 144	Yonges Island, (H6) 500
Union, (B2). 306	Whitmire, (E3)... 1,955	Williston, (F5)... 854	Woodruff, (E2)... 2,396	York, (F1)..... 2,731
ville, (G3)... 100	Wilkins, (G7)..... 900	Wilson, (H4)..... 100	Woodward, (F2).. 100	Zion, (K3)..... 197
ehall, (G6)... 200	Williams, (G5)..... 100	Windsor, (E5)..... 103		

ing of towns in which houses, stores, schools, and churches are owned entirely by the companies.

Transportation. In 1928 there were over 3,700 miles of railway in the state, the greater part being operated by the South's important trunk lines, the Southern, the Atlantic Coast Line, and the Seaboard Air Line. There are also many shorter roads connecting with these main lines, and over 125 miles of electric road. There are over 12,000 miles of surfaced roads within the state.

The larger rivers are navigable by steamboats as far as the fall line. Canals have been proposed which would afford navigation beyond the Savannah and across Florida to the Gulf, opening a safer and shorter route to Panama. Charleston is one of the important seaports on the Southern Atlantic, and is one of the greatest cotton ports of international trade. At Georgetown, on Winyah Bay, there is another important commercial harbor.

Charleston, Beaufort, and Georgetown are ports of entry (see PORT OF ENTRY).

Government and History

Government. South Carolina has had six state constitutions; the present one was adopted in 1895. Amendments may be proposed in either house of the legislature, and if approved by two-thirds of the members of each house, they are submitted to the voters. Constitutional conventions may be called when voted for by a two-thirds majority in each house and a majority of state electors. In an attempt to restrict the negro vote, strict qualifications for voters have been demanded. Only those citizens are entitled to vote who are able to read and write any section of the Constitution, or who have paid taxes or the preceding year on property worth \$300 or more; and have lived in the state two years, in the county one year, and in the precinct four months.

The *legislative power* is vested in a general assembly which consists of a senate and a house of representatives. There are forty-six senators, half of the number being elected every two years; and 124 representatives, elected for two years.

The *executive department* consists of the governor, who is ineligible to succeed himself, lieutenant governor, secretary of state, comptroller-general, attorney-general, treasurer, adjutant and inspector-general, and superintendent of public instruction, all of whom are elected by the people for two years.

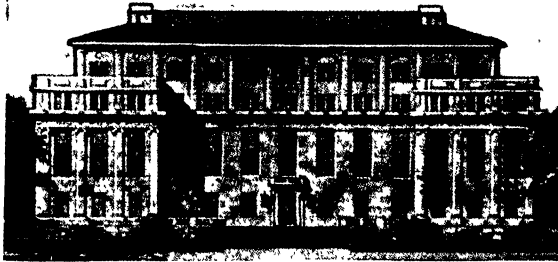
The *judicial power* is vested in the supreme court, circuit courts, courts of common pleas, and general sessions. The chief justice of the supreme court and four associate judges are elected by a *viva voce* vote in the general assembly for terms of ten years. Fourteen cir-

cuit judges are elected in the same manner for four years, and justices of the peace are appointed by the governor.

The state constitution is peculiar in that it contains numerous provisions for the prevention of lynching, and in being the only state constitution which prohibits divorce upon any cause. State-wide prohibition was in force before the Federal amendment became effective. The right to hold state office is denied to persons

who do not believe in the existence of a Supreme Being.

Colonization and Proprietary Government. South Carolina was visited by Spaniards from Cuba in 1520. In 1562 the French settled at Port Royal, but soon abandoned the settlement. About a hundred years



STATE OFFICE BUILDING

later, Charles II of England, claiming the territory through discoveries in North America by Cabot, granted the tract including the Carolinas and extending as far west as the Pacific to a company of eight lords proprietors. The first permanent settlement was made at Charleston in 1670. The early history of the colony is a story of continuous struggle between the people and the proprietors. The "Fundamental Constitutions," framed by John Locke, outlined an impractical, obsolete feudal system which had some influence in establishing a slave-holding aristocracy. The weakness of the proprietors, and their mismanagement of the province, eventually resulted in the overthrow of their rule by the South Carolinians (1719). Ten years later, the transfer of Carolina to the royal government was completed, and North and South Carolina, which had long had separate governors, officially became distinct royal provinces. The Spaniards from Florida,

QUESTIONS ON SOUTH CAROLINA

(An Outline suitable for South Carolina will be found with the article "State.")

Give some facts about the population make-up of South Carolina.

What are some of the native flowers and birds of South Carolina? Tell something about them.

How does the present production of phosphate compare with that of former years? How do you account for this?

What were the activities of this colony during the Revolution? Of the state in the War of Secession?

What are some of the fish of South Carolina?

What eminent English philosopher had a part in drawing up the early instrument of government for the colony?

What effect has the boll weevil had on agriculture? On farm labor?

How large a part of the area is under forests? What are the principal woods? Upon what did England base its claim to this region?

Where was the first English settlement made?

Why has the educational problem in this state been unusually difficult?

What indication is there that the difficulty is being overcome?

How old is the present state constitution?

How many constitutions had the state before the present one?

What are some of the provisions of the constitution peculiar to South Carolina?

What is South Carolina's most important crop? Why is rice no longer cultivated?

What is the fall line, and how can you trace it on a map on which it is not specifically indicated? See FALL LINE.

Of what advantage is it to a state to have a fall line distinctly marked?

What is the Piedmont Plateau? The Coastal Plain? Trace each on a relief map and explain how they were formed.

Why are the minerals of the Coastal Plain confined to substances such as clay, gravel, and marl?

How many of the states are larger than South Carolina? How many of these larger states have a greater population?

What great change has taken place in the agriculture of the state?

Why was it necessary, and is it an improvement?

Who were the "carpetbaggers" and what did they do?

From what two great disasters did the state suffer in the late nineteenth century?

What is the state motto? How has South Carolina proved its right to this motto?

What is the popular name of the state? Describe the tree to which it has reference.

Why was that tree chosen as the emblem?

The name of what river is spelled in two ways?

What is peculiar about the mill towns of South Carolina? Can you see any danger in this condition? Explain.

Of what importance is hydroelectric power and why is it so available here?

What is the chief industry? How does it compare in volume with the total?

What great native of South Carolina became the spokesman for the South in the slavery agitation?

How do the whites in the states endeavor to restrict the negro vote?

Can the governor of South Carolina succeed himself?

How are the mountain families of the state induced to labor in the cotton mills?

What is meant by "Blue Laws," and are they prevalent in South Carolina?

What were the chief difficulties encountered by the early settlers in the colony, and by the citizens after statehood was gained?

What was the status of South Carolina as a crown colony?

How many cities of more than 10,000 people has the state?

he Indians, and the pirates all harassed the early colonists, and added to their hardships and sufferings.

A small bag of rice from Madagascar had been left at Charleston. The seed was planted, and soon South Carolina was producing rice both for home use and for export. Indigo was another crop which was bringing wealth to the plantation-owners. Around Charleston centered the culture and the social life of the state. In the northern and western part, the "up country" people were sturdy Scottish Covenanters, French Huguenots, and Welsh and Swiss farmers. But in the low country were the large plantation-owners, with their hundreds of slaves, their rice and cotton fields, their town houses, and fine carriages. They reflected European life more than American; they imported their furniture, clothing, and luxuries from Europe, and sent their children abroad to be educated.

Royal Government. As a crown colony, the contests between the popular legislature and the royal governor and council continued. The spirit of democracy grew, and delegates were sent to the Stamp Act Congress and to the Continental Congress. The royal government was overthrown, and a state constitution was framed in March, 1776.

Statehood. South Carolina took an aggressive part in the Revolution, contributing more money than any other colony except Massachusetts, and as much as the other eleven combined. It also furnished many famous soldiers, among whom were Sumter and Marion (which see). Because of its large number of early colonists, South Carolina was torn by bitter feeling and local conflict. A British attack upon Charleston in 1776 was repulsed, but in 1780 the city was captured, and it remained in the hands of the British to the end of the war. Notable battles in South Carolina were Camden, King's Mountain, Hobkirk's Hill, and Eutaw Springs. See **REVOLUTIONARY WAR IN AMERICA**.

After much discussion, the Federal Constitution was ratified in 1788, and South Carolina became the eighth of the thirteen original states. The political conflicts were continued between the "low country," or rich-planter faction, and the Scotch-Irish settlers of the "up country." The state was strongly anti-Federalist, and ardently advocated states' rights and free trade. In 1832, when the Clay Tariff Act was passed by Congress, South Carolina passed the Ordinance of Nullification, declaring the act null and void in the state, and secession was averted only by compromise. Under the leadership of John C. Calhoun, South Carolina became the spokesman of the South and the champion of secession.

It was the first state to secede from the Union, and the first battle of the War of Sec-

ession was fought at Fort Sumter, within its borders. The white population was small, but over 60,000 men joined the Confederate army. Although the state suffered heavy losses during the war, the period of reconstruction was even more disastrous. From 1868 to 1876, the state was under "carpetbag" government of Northern adventurers and negro politicians, and crime and corruption were rife. In 1876 the whites recovered control of the government.

On August 31, 1886, much of Charleston was destroyed by a severe earthquake, and in 1893 the state suffered another disaster, when the coast was swept by a tidal wave. Progress has been slow, but since 1915 development has been more rapid. The hydroelectric development of the Southern states has been a magic wand awakening the states to their possibilities, and to the promising future ahead. In 1923, cities of 20,000 to 50,000 population were empowered to adopt the city-manager form of government. In 1927 a campaign was started for the enforcement of Sunday Blue Laws, which prohibited all Sunday sports, and the sale of gasoline, newspapers, automobiles, etc., on Sunday. Many arrests were made and injunctions issued during 1927 and 1928. Cases brought to the supreme court received the decision that non-commercial golf was lawful, while sale of gasoline was permissible only on occasions of emergency or mercy. P.W.

Related Subjects. The following articles in these volumes will give much additional information about South Carolina:

CITIES

The cities listed below are described under their own titles. For others, see back of state map.

Charleston	Columbia
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HISTORY

Calhoun, John C.	Nullification
Carpetbaggers	Reconstruction
Fort Moultrie	States' Rights
Fort Sumter	War of Secession
Ku-Klux Klan	

LEADING PRODUCTS

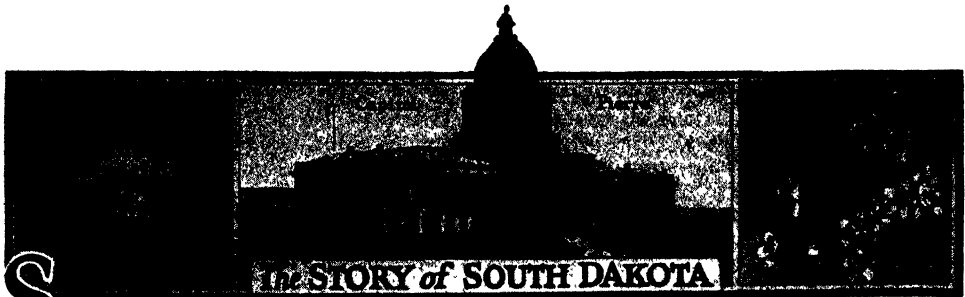
Corn	Oyster
Cotton	Tobacco

PHYSICAL FEATURES

Blue Ridge	Savannah River
Piedmont Region	

SOUTH CAROLINA INTERSTATE AND WEST INDIAN EXPOSITION, an exposition held in Charleston, S. C., on a site of about 250 acres. The exposition lasted from December 1, 1901, to June 2, 1902, and was attended by 674,086 persons. The cost of the project was \$1,250,000, while the receipts were \$313,000. An enumeration of important exhibition buildings indicates the character of the exhibits; they included Agriculture, Art, Commerce, Cotton Palace, Fisheries, Machinery, and Mines and Forestry. Staff, with a dull-white coating, was used in the construction of the larger buildings.

SOUTH CHINA SEA. See **CHINA SEA**.



SOUTH DAKOTA. Popularly known as **THE SUNSHINE STATE**, South Dakota is one of the North-Central states of the American Union. It lies partly within the great central prairies, and contains a region of noted beauty and mineral wealth in the famous Black Hills. The name Dakota is the North American Indian word meaning *allies*, and refers to the allied Indian tribes, or Sioux Confederation, which occupied that territory. The flower emblem of the state is the pasque flower, an anemone.

The pioneers of both Dakotas came in search of furs or to trade with the Indians for them; the ranchmen and their herds followed the Indian and the buffalo on the ranges. Then, in South Dakota, came the discovery of gold in the Black Hills, and later the growth of agricultural interest, so that the southern section developed and prospered in two diverse fields. Generously has South Dakota given wealth to its people—the tangible gold of the hills, the gold of the corn, of ripened wheat fields, and over all, the shimmering gold of the abundant sunshine.

Size and Location. The state lies between North Dakota and Nebraska, and covers a rectangular area of 77,615 square miles, of which 747 square miles are water. From Minnesota, on the east, to Wyoming, on the west, South Dakota extends for 380 miles; from north to south, for over 200 miles. It is larger than all of the New England states together, or as large as Ohio and Indiana combined; among the states of the Union, it ranks fourteenth in size.

The People. In 1920, South Dakota, with 636,547 inhabitants, ranked thirty-seventh in population among the states. There were 704,000 people in the state in 1928, according to the Federal estimate. The percentage of foreign-born has steadily declined, a little over thirteen per cent of the population now being of foreign birth. The nationalities represented are chiefly Norwegian, German, Russian, Swedish, and Danish. In 1927 there were over 23,000 Indians upon the state reservations, occupying, in all, about 500 square miles.

Although the population is steadily increasing, there are still fewer than ten people to

the square mile. Only sixteen per cent of the inhabitants live in towns and cities; the cities with populations of more than 10,000 are Sioux Falls, Aberdeen, Watertown, Huron, and Mitchell. Other important towns are Rapid City, Lead, Yankton, and Pierre, the capital.

The largest of the religious bodies is the Lutheran; other denominations of importance are the Roman Catholic, Methodist, Congregational, Presbyterian, Episcopalian, and Baptist.

Education. A well-organized system of rural and city elementary and high schools is supervised by the state superintendent of public instruction. Under his general direction are county superintendents and district boards of education. A permanent school fund is derived from the sale of land, two sections of which are set aside in each township for school purposes. In 1923 both wages and educational requirements for teachers were raised. Agricultural, home-economics, and industrial or trade courses have been established in many high schools in recent years. This vocational work, commonly known as Smith-Hughes work, is given Federal aid, and is directed in the state by a board of education, of which the state superintendent is chairman. In 1927 state aid for the rural and consolidated schools was withdrawn by the legislature. Radio has been adopted as one of the means of education in the public schools throughout the state.

In 1923 a law was passed making a minimum term of eight months requisite in all schools; a compulsory-attendance law was enacted, requiring 127 days per year average attendance for rural pupils. The illiteracy average of the state is 1.7.

The denominational colleges, mostly co-educational, are Huron College (Presbyterian), at Huron; Dakota Wesleyan University (Methodist), at Mitchell; Yankton College (Congregational), at Yankton; and Columbus College (Catholic), Augustana College (Lutheran), and Sioux Falls College (Baptist), all at Sioux Falls.

The government maintains three Indian schools, one each at Flandreau, Rapid City, and Pierre. The state maintains a system of higher education, supervised by a board of

five regents appointed by the governor. There are seven state-supervised schools: the state university at Vermilion; the State College of Agriculture and Mechanic Arts at Brookings; the School of Mines at Rapid City; and four normal schools, located, respectively, at Aberdeen, Madison, Spearfish, and Springfield. The two largest schools are described below:

The University of South Dakota, at Vermilion, was founded by act of the first territorial legislature, in 1862, and first opened in 1883. When the state was admitted into the Union, in 1889, the university received seventy-two sections of land. The annual income is derived largely from an appropriation by the state legislature and income from the land grants. The university is organized into colleges of arts and sciences, law, medicine, engineering, and music. The state conducts its work in geology, natural history, public health, and pure food and drugs through the institution.

South Dakota State College, at Brookings, owes its origin, as do most of the colleges of agriculture and mechanic arts, to the so-called Morrill Act, signed by President Lincoln in 1862. The first state appropriation for the college was made by the territorial legislature of 1883, and the college was opened in September, 1884. By various government and state acts, the income from the sale or rental of land grants, totaling 160,000 acres of land, has been set aside for the college use. The college also receives \$50,000 per year from the Federal government, in addition to state support. By Federal and state acts, the

college has been made the seat of the South Dakota State Experiment Station and the South Dakota Agriculture and Home Economics Extension Service. It likewise supervises four experimental substations, located, respectively, at Eureka, Vivian, Highmore, and Cottonwood. It has two types of four-year students, one group pursuing regular four-year courses leading to the degrees of Bachelor of Science in Agriculture, Engineering, Home Economics, Pharmacy, and General Science. The general-science division offers four years' work in several courses, among them applied science, printing and rural journalism, commercial science, and music. The other type pursues courses appropriate to a secondary school of agriculture, fitting boys and girls for farm life.

Charities and Corrections. A board of five members, appointed by the governor, controls state institutions of charity and correction. The wards of the state are well cared for. The state supports a tuberculosis sanitarium at Custer; a school for the blind at Gary; an insane asylum at Yankton; an institution for the feeble-minded at Redfield; a reformatory at Plankinton; a children's home, a school for the deaf and dumb, and the penitentiary, all at Sioux Falls. The honor system is in force in the penitentiary, and many of the prisoners work outside of the prison. Capital punishment was abolished in 1915. There is a national soldiers' home at Hot Springs.

Physical Features and Resources

The Land. South Dakota is an undulating plain, rising from the level prairie region of the east to the rough plateaus and buttes of the Black Hills, in the southwestern part of the state.

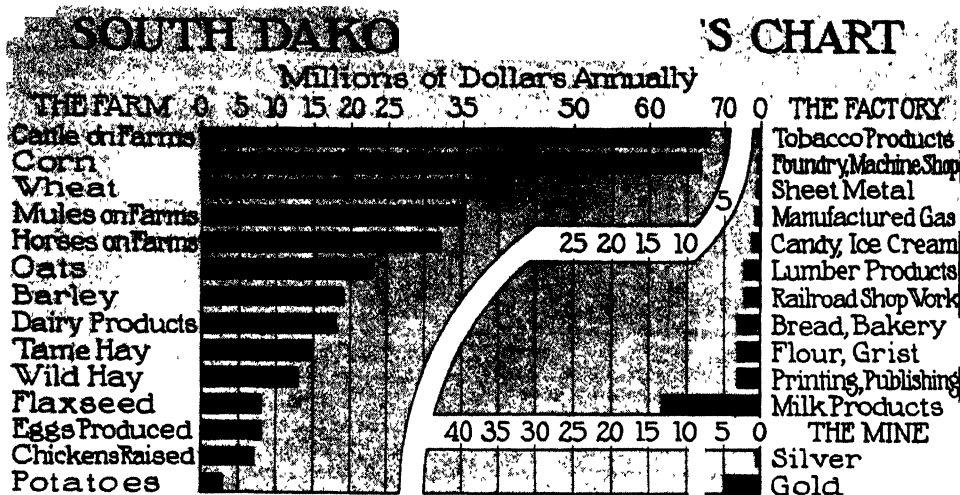
These hills and mountains, covered with dense, dark pine forests, are cut by the magnificent canyons of the North Fork of the Cheyenne River and many mountain streams. Jagged peaks and domelike summits, open parks, thick forests, fantastically shaped pinnacles, and mesas, caves, and lakes afford scenery notable for its wild and weird beauty. Crystal and Wind caves, Spearfish Canyon, Cathedral Park, and the fossil remains at the base of Matties Peak are especially noteworthy. The Wind Cave region has been made a national park, and a splendid state park is maintained. The State Game Lodge in the state park was selected by President Coolidge for his 1927 summer White House. In these hills, Harney Peak, the highest point in the state and the highest between the Rockies and the Atlantic Ocean, rises 7,242 feet. The town of Deadwood is situated nearly a mile above sea level. East of the Black Hills, and bordering White River for many miles, in the southwest corner of the state, are South Dakota's noted Bad Lands, a maze of curiously carved ridges and clay mounds from which rise grotesque pinnacles and columns, topped with mushroom-

like caps of sandstone. Most of the region is bare, varicolored clay, but some of the hollows and flat-topped mesas are covered with grass, and are used for grazing. Smaller districts of the Bad Lands border the Grand and the Owl, or Moreau, rivers.

The greater portion of the western half of the state is a region of vast plains, varied with hills, ravines, and a few small forest patches. These are the grazing lands of the state, once the home of the cowboy. There are many isolated clusters of hills in the western and central sections, which are strangely shaped by wind and rain (see EROSION).

East of the Missouri River, which cleaves the state into nearly equal halves, are rich prairies, broken in the north by rounded hills which are called the Coteau des Prairies. The central portion of the state is crossed by a table-land following the Missouri River, known as the Coteau du Missouri. The lowest part of the state lies along the shores of Big Stone Lake, on the Minnesota border, where the land is 965 feet above sea level.

Rivers and Lakes. One of the topographical distinctions between the eastern and western halves of the state is the direction of the drainage. West of the Missouri, which crosses the center of the state from north to southeast, the rivers flow eastward; east of it, they drain toward the south. The Missouri receives



Figures are from Federal and state sources, and present averages for three years.

practically all the drainage of the state, making it South Dakota's largest river. Near the eastern border, it is joined by the James River, which rises in North Dakota. Another tributary, the Big Sioux, forms the boundary between South Dakota and Iowa. The Grand, Owl, Cheyenne, and White rivers rise in the hills of the extreme western part of the state, and flow east through deep, narrow valleys to the Missouri. The largest of these is the Cheyenne, dividing into the North Fork, or Belle Fourche, and the South Fork, which encircle the Black Hills. The extreme northeast corner of the state is drained by the Minnesota River, through Big Stone Lake.

Lake Traverse and Big Stone Lake are long, narrow bodies of water forming part of the eastern boundary with Minnesota. The eastern prairies of South Dakota are dotted with many ponds and small lakes. Sylvan Lake, in the Black Hills, is a popular resort. The valleys of the James and Missouri rivers are underlaid with water which comes to the surface in hundreds of artesian wells, there being over three thousand of them east of the Missouri River. The waters of these wells range from cold to a temperature of 130° F. Some of the artesian wells exert a pressure so remarkably strong and regular that they are used for driving machinery.

Climate. South Dakota is noted for its cloudless skies, and no Northern state has more days of sunshine. The climate is dry, invigorating, and healthful, and is characterized by a wide variation in the annual temperature. The average yearly temperature is about 44°, which is higher than that of either Minnesota or New Hampshire, in the same latitude. The coldest part of the state is in the northeast.

The winter climate is so variable that no standard for it can be determined; one winter may be mild, without heavy snow and with high temperatures, while the next will be cold, with deep snows and frequent high winds. In the western portion, cattle graze throughout the winter, frequently without shelter. The annual rainfall averages 20.4 inches. It is heaviest during the crop-growing months, and the greatest amount falls in the southeastern and eastern parts.

Parts of South Dakota feel the influence of the chinook winds (see CHINOOK), which melt the snows with great rapidity. Less beneficial are the hot winds, which in the summer sometimes sweep up from the hot, dry regions far to the south, withering and blighting the crops in their path.

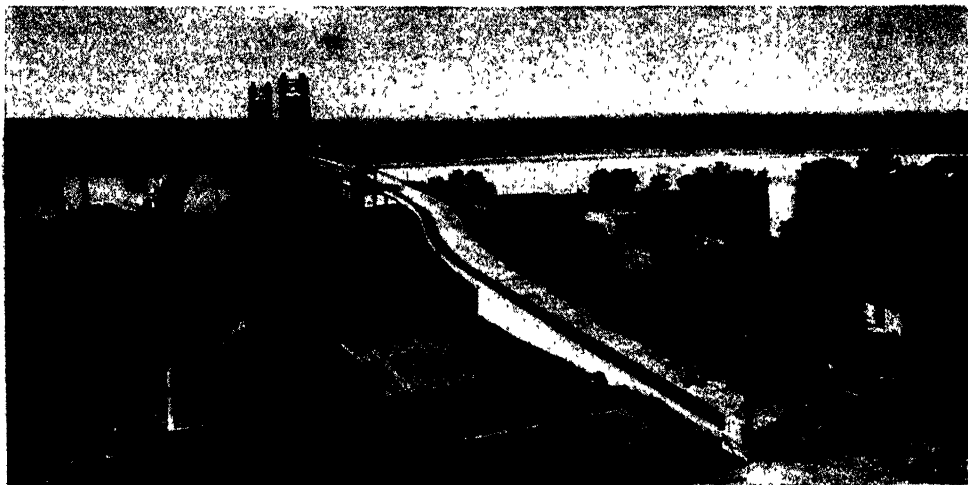
Agriculture. South Dakota is preëminently an agricultural state. The abundance of sunshine, the rich soil, and the plentiful rainfall of the eastern river valleys are all favorable to the production of big crops of wheat and corn. The rich, black loam of the river bottoms, in the southeastern section of the state, produces the heaviest corn crops, although corn is now found in every county and is the leading crop of the state, producing an average of over 100,000,000 bushels annually.

Wheat is second in importance, and in the output of spring wheat South Dakota is usually surpassed only by North Dakota and Montana. The northern half of the state, east of the Missouri River, still produces the greater part of the small grain. Other cereals raised in large quantities include oats and barley. Quantities of flaxseed, hay, and vegetables, particularly potatoes, are grown, and the hardier fruits, such as apples, plums,



Photo: U & U

The "Bad Lands" in the Black Hills. Calvin Coolidge was the first President to choose a Western vacation spot. He spent a summer only a few miles from the "Bad Lands."



HIGHWAY BRIDGE OVER THE MISSOURI RIVER AT YANKTON

and cherries, are cultivated in this region. Where irrigation is needed in the eastern section, water is furnished by the numerous artesian wells, many of which have a flow of from 2,000 to 4,350 gallons per minute.

On the broad plains west of the Missouri River, forage and grain crops are grown, and on the uncultivated areas large herds and flocks graze; here stock-raising and dairying are important industries.

Where the Belle Fourche Dam, a government irrigation project, waters over 100,000 acres in the northwest, considerable agricultural advancement has been made. Orchards, fields of sugar beets, and waving grains and alfalfa may be seen here. A million-dollar sugar-beet factory was built at Belle Fourche in 1927, to encourage the growing of sugar beets.

The Black Hills region, with its sheltered valleys, produces a variety of crops and fruits, but scarcely more than enough for the needs of the people of that section, except alfalfa seed, wool, and dairy products. On the rougher areas and in the wooded reserves, grazing is important.

There are fringes of timber along the streams and a few planted groves in the east, but the only extensive forest area is in the Black Hills, where the western yellow pine and white spruce predominate, and where a considerable amount of lumber is produced annually. Since 1913 a bounty has been provided for the planting of forest trees. The national forests of South Dakota embrace over 1,000,000 acres in the Black Hills region.

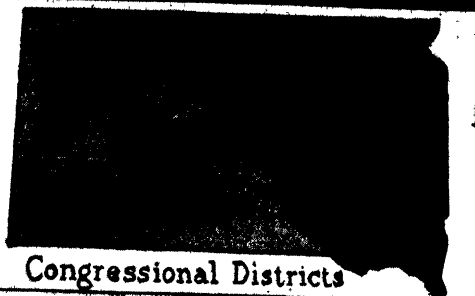
Mining. The Black Hills constitute one of the most valuable gold districts in the United States, and are said to contain the richest hundred square miles in the world. In the gold output of the United States, South Da-

kota is one of the principal states. The state's annual gold production ranges from \$6,000,000 to \$7,000,000, and practically all of it is produced by the famous Homestake Mine, at Lead City. Silver is an important product obtained in the refining of the gold, and lead, mica, tungsten, gypsum, granite, sandstone, limestone, and other valuable minerals are found. Coal and lignite beds lie practically untouched in the northwestern area of the state, because of the lack of transportation. An excellent paving and building stone, known as red quartzite, or Sioux Falls jasper, is quarried along the Big Sioux River, in the southeastern corner of the state. Chalkstone, used in the manufacture of cement, is found near Yankton and in the Black Hills, where, at Rapid City, there is a state-owned cement mill. Large quantities of brick and fire clays are found throughout the state.

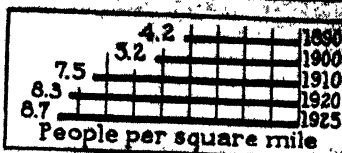
Manufactures. Manufacturing is closely related to agricultural pursuits; it is as yet of comparatively small importance. The production of butter, cheese, and condensed milk leads all manufacturing enterprises by a big margin. Flour, feed, and grain-mill products are second, while baking products follow in third place. Railway-car construction and repair, and the manufacture of lumber and timber products, are important industries. There is a large meat-packing plant at Sioux Falls, and, recently, smaller plants have been opened at Watertown and Huron.

Transportation. The eastern half of the state is marked by a network of railroads, but great areas in the western section are without transportation. There are about 4,200 miles of railroad in the state. The Chicago, Milwaukee, Saint Paul & Pacific and the Chicago & North Western extend across the state to

SOUTH DAKOTA



Congressional Districts



Sylvan Lake

the Black Hills. This region has numerous branch lines and spurs, due to the extensive mining interests. Other railroads are the Great Northern, the Chicago, Burlington, and Quincy, and the Chicago, Rock Island &

Pacific. Constructed since 1923, six large bridges, crossing the Missouri River, greatly facilitate communications; and the state now has a splendid network of graveled highways, reaching to all sections.

Government and History

Government. South Dakota is governed by its original constitution, adopted in 1889. A convention for the revision of the constitution may be called if approved by two-thirds of the members of each house of the legislature and a majority of the voters. Amendments must not only be approved by a majority of the members of each house, but must be submitted to the vote of the people at the following election. All citizens over twenty-one years of age, who have resided in the United States five years, in the state one year, in the county ninety days, and in the precinct thirty days, are entitled to vote. The privilege of absent voting was extended in 1925 to voters unable to attend the polls because of illness or other disability. The right to the initiative, applying to statutes, though not to amendments, is in force. There is a referendum law.

The *legislature* consists of a senate and a house of representatives, elected biennially. The senate is composed of not fewer than twenty-five, nor more than forty-five, members, and the house of representatives of not fewer than seventy-five, nor more than 135, members.

The *executive officials* are a governor, lieutenant governor, secretary of state, auditor, treasurer, attorney-general, superintendent of public instruction, and commissioners of schools and public lands, all of whom are elected biennially. The treasurer cannot be elected for more than two successive terms. The governor's power of veto does not extend to measures passed by popular vote.

The *judicial department* consists of the supreme court, circuit and county courts, justices of the peace, and police magistrates. All judges are elected by the people.

History. It is said that Frenchmen visited South Dakota as early as 1683, for a map drawn by Charles Pierre Le Seur shows the Missouri and Big Sioux rivers, the lakes, and the location of the Indian tribes. It is possible that the Spanish traders had come into the Dakotas even earlier than the French. In 1743 Verendrye and his brothers visited the "land of the Dacotahs," and French fur traders, following, claimed the land for France.

In 1803, however, the territory was acquired by the United States, for it was a part of the Louisiana Purchase. The open prairies were then the home of the warlike Dakota Indians. Closely following the purchase came the explorers, Lewis and Clark, on their memorable northwest expedition of 1804-1806. Settle-

ment, however, was slow, because of the remoteness of the territory and the hostility of the Indians.

By 1812 Manuel Lisa (see MISSOURI) had a strong trading post near Big Bend. Because of his friendly relations with the Indians, he was made Indian agent. He is credited with having brought the first domestic cattle to South Dakota, and he pleased the Indians greatly by giving them many new vegetable seeds to plant with the maize they had grown for many years before the white man came.

The *Yellowstone*, the first steamboat on the Missouri, ascended the river to Fort Pierre in 1831, where, during the next year, a trading post was established by the American Fur Company. This settlement was later sold to the government, and it became an important military post of the Northwest. By 1855 fur trading had ceased to be a large industry in South Dakota. In 1856 a permanent industrial settlement was made at Sioux Falls, and within a few years many settlements were established along the Missouri River and in the eastern part of the present state.

The Dakotas were a part of the Missouri Territory until 1820, and the eastern section was successively included in the territories of Michigan, Wisconsin, Iowa, and Minnesota. From 1854 to 1861, the western part of the present states of North Dakota and South Dakota was included in Nebraska Territory. In 1861 the Territory of Dakota was organized, including North Dakota, South Dakota, Montana, and part of Wyoming. Its development was retarded by the War of Secession and local Indian disturbances. Under the famous chiefs, Spotted Tail, Red Cloud, and Sitting Bull, there were many serious uprisings, known as the Sioux Wars.

In 1874 an exploring party under Custer discovered gold in the Black Hills. In 1876 the famous Homestake Lode was located. Strife with the Indians and lack of transportation delayed development of the state. South Dakota was at that time typically wild West, with its Indian uprisings, its ranges, where the cowboy was a picturesque figure, and its little mining towns, with their lack of comforts overlooked by reason of the glamour of wealth. Then came the railways, a rapid influx of settlers, and an improvement in ways of living.

In 1882 the territory was divided into two sections, and the Dakotas acquired their present limits. The south section was the first to

SOUTH DAKOTA

Aberdeen, (N3).....	15,036	Bristol, (O3).....	621	Conde, (N3).....	526	Fairburn, (C6).....	130	Hecla, (N2).....	533
Agar, (J4).....	150	Britton, (O2).....	1,113	Corona, (R3).....	147	Fairfax, (M7).....	512	Henry, (P4).....	425
Alaska, (J3).....	128	Broadland, (N5).....	115	Corsica, (N7).....	450	Fairview, (R7).....	163	Hermosa, (C6).....	93
Albee, (R3).....	116	Brookings, (R5).....	4,613	Cottonwood, (F6).....	159	Faith, (E3).....	506	Herreid, (E2).....	473
Alcester, (R7).....	481	Bruce, (R5).....	310	Crandall, (O3).....	200	Farmer, (O6).....	145	Herrick, (L7).....	419
Alexandria, (O6).....	865	Bryant, (O4).....	632	Crandon, (N4).....	150	Faulkton, (L3).....	815	Hetland, (P3).....	233
Alpena, (N5).....	521	Buffalo, (B2).....	150	Cresbard, (M3).....	348	Fedora, (O6).....	250	Higmore, (L4).....	1,224
Altamont, (R4).....	127	Buffalo Gap, (C6).....	104	Crocker, (O3).....	86	Ferncy, (N3).....	220	Hill City, (B6).....	308
Amherst, (O2).....	200	Burbank, (R8).....	100	Crooks, (R6).....	150	Flandreau, (R5).....	1,850	Hillsview, (K2).....	97
Andover, (O3).....	353	Burke, (L7).....	700	Custer, (R6).....	802	Florance, (P3).....	306	Hitchcock, (N4).....	331
Ardmore, (B7).....	204	Bushnell, (R5).....	177	Dallas, (K7).....	645	Forestburg, (N5).....	200	Holabird, (K4).....	125
Arlington, (P5).....	977	Butler, (O3).....	180	Dante, (N7).....	157	Forest City, (J3).....	100	Holmquist, (O3).....	250
Armour, (N7).....	966	Camp Crook, (B2).....	141	Davis, (R7).....	236	Fort Pierre, (J5).....	759	Hosmer, (K2).....	513
Artas, (K2).....	177	Canistota, (P6).....	540	Deadwood, (B5).....	2,432	Frankfort, (N7).....	443	Hot Springs, (B7).....	2,447
Artesian, (O5).....	606	Canova, (P6).....	339	Dell Rapids, (R6).....	1,582	Frederick, (N2).....	372	Houghton, (N2).....	150
Ashton, (N4).....	365	Canton, (R7).....	2,562	Delmont, (N7).....	513	Freeman, (O7).....	917	Hoven, (K3).....	307
Astoria, (R4).....	243	Capa, (G5).....	150	Dempster, (R4).....	100	Fruitdale, (B4).....	80	Howard, (P5).....	1,120
Athol, (M3).....	150	Carlock, (L7).....	150	De Smet, (O5).....	1,009	Fulton, (O6).....	209	Hudson, (R7).....	486
Aurora, (R5).....	235	Carlyle, (L3).....	100	Dimock, (N7).....	180	Galena, (B5).....	59	Humboldt, (P6).....	426
Avon, (O7).....	650	Carpenter, (O4).....	150	Dixon, (L7).....	150	Gannaville, (M5).....	250	Hurley, (P7).....	626
Badger, (P5).....	194	Carter, (J7).....	94	Doland, (N4).....	603	Garden City, (O4).....	258	Huron, (N5).....	10,204
Baltic, (R6).....	307	Carthage, (O5).....	663	Dolton, (P7).....	123	Garretson, (S6).....	678	Interior, (F6).....	129
Bancroft, (O5).....	165	Castlewood, (R4).....	559	Draper, (J6).....	157	Gary, (R4).....	533	Iona, (L6).....	100
Bellefourche, (B4).....	1,244	Cavour, (N5).....	201	Dupree, (F3).....	269	Gayville, (P8).....	309	Ipswich, (L3).....	918
Belvidere, (G6).....	163	Centerville, (R7).....	1,168	Eagle Butte, (G3).....	251	Geddes, (M7).....	1,002	Irene, (P7).....	466
Bemis, (R4).....	150	Central City, (B5).....	189	East Sioux Falls, (R6).....	268	Glenham, (J2).....	169	Iroquois, (O5).....	641
Beresford, (R7).....	1,507	Chamberlain, (L6).....	1,521	Eden, (P2).....	165	Goodwin, (R4).....	148	Java, (K3).....	510
Bigstone City, (R3).....	581	Chancellor, (R7).....	270	Edgemont, (B7).....	1,092	Greenway, (K2).....	150	Jefferson, (R8).....	510
Bijou Hills, (L6).....	200	Chelsea, (M3).....	111	Egan, (R5).....	426	Greenwood, (N8).....	300	Jordan, (J7).....	150
Bison, (D2).....	200	Chester, (R6).....	160	Elbon, (F5).....	109	Gregory, (L7).....	1,251	Junius, (P5).....	150
Black Hawk, (C5).....	100	Cheyenne Agency, (J3).....	100	Elk Point, (R8).....	1,319	Grenville, (P3).....	256	Kadoka, (F6).....	342
Blunt, (J4).....	504	Claire City, (P2).....	229	Elkton, (R5).....	852	Groton, (N3).....	1,113	Kaylor, (O7).....	150
Bonesteel, (M7).....	609	Claremont, (N2).....	310	Emery, (O6).....	600	Hamill, (K6).....	125	Kennebec, (K6).....	354
Bonilla, (M4).....	125	Clark, (O4).....	1,279	Englewood, (B5).....	104	Harrisburg, (R7).....	205	Keystone, (C6).....	320
Bowdle, (K3).....	769	Clear Lake, (R4).....	976	Erwin, (P4).....	264	Harrison, (M7).....	120	Kidder, (O2).....	200
Bradley, (O3).....	310	Colman, (R6).....	475	Esmond, (O5).....	131	Harrold, (K4).....	342	Kimball, (M6).....	1,193
Brandon, (R6).....	307	Colome, (K7).....	630	Estelline, (R4).....	585	Hartford, (P6).....	645	Kingsburg, (N8).....	250
Brandt, (R4).....	307	Colton, (R6).....	553	Ethan, (N6).....	369	Hayti, (P4).....	327	Kranzburg, (R4).....	100
Brentford, (N3).....	173	Columbia, (N9).....	770	Farmington, (K2).....	1,228	Hazel, (P4).....	221	Labolt, (R3).....	137
Bridgewater, (P6).....	934								

SOUTH DAKOTA *Continued*

Lake Andes, (M7)...	849	Mobridge, (J2)....	2,822	Quinn, (E6).....	137	Stickney, (M6)....	426	Wagner, (N7).....	1,444
Lake Norden, (P4)...	451	Monroe, (P7).....	235	Ramona, (P5).....	313	Stockholm, (R3)...	116	Wakonda, (R7)...	441
Lake Preston, (P5)...	1,026	Montrose, (P6)...	471	Rapid City, (C5)...	7,465	Strandburg, (R3)...	124	Wakpala, (J2)....	150
Lane, (N5).....	310	Morristown, (F2)...	208	Ravinia, (N7).....	161	Stratford, (N3)...	261	Wall, (E6).....	209
Langford, (O2)....	436	Mound City, (K2)...	228	Raymond, (O4)....	268	Strool, (D2).....	200	Wallace, (P3)....	209
Lantry, (G3).....	348	Mount Vernon, (N6)	601	Redfern, (B6).....	100	Sturgis, (C5).....	1,448	Ward, (R5).....	93
Laplant, (H3).....	68	Murdo, (H6).....	748	Redfield, (M4)...	2,751	Summit, (P3)....	490	Warner, (N3)....	250
Lead, (B5).....	6,810	Naples, (O4).....	105	Ree Heights, (L5)...	312	Tabor, (O8).....	422	Wasta, (E5).....	250
Lebanon, (K3).....	351	Nemo, (B5).....	100	Reliance, (K6)....	291	Tea, (R7).....	168	Watauga, (G2)...	220
Le Beau, (J3).....	210	Newark, (O2).....	183	Reville, (R4).....	365	Terraville, (B5)...	491	Watertown, (P4)...	10,319
Lemmon, (E2).....	1,077	New Effington, (R2)	328	Rockham, (M4)...	371	Terry, (B5).....	600	Waubay, (P3)...	1,007
Lennox, (R7).....	1,072	Newell, (C4).....	387	Roscoe, (L3).....	427	Thomas, (P4).....	125	Webster, (P3)...	1,687
Leola, (M2).....	620	New Underwood,		Rosebud, (H7)....	110	Thunder Hawk, (F2)	170	Wecota, (L3)...	200
Lesterville, (O7)...	291	(D5).....	186	Rosholt, (R2)....	314	Timber Lake, (H3)	537	Wentworth, (R5)...	309
Letcher, (N6).....	426	Nialand, (B4).....	156	Roslyn, (P2).....	255	Tolstoy, (K3)...	244	Wessington, (M5)...	717
Lily, (O3).....	169	Northville, (M3)...	275	Roswell, (O6)....	148	Toronto, (R4)....	392	Wessington Springs,	
Little Eagle, (H2)...	100	Nowlin, (G5).....	100	Roubair, (B5)....	100	Trent, (R6).....	263	(M5).....	1,414
Loomis, (N6).....	250	Nunda, (R5).....	176	Rowena, (R6)....	100	Tripp, (O7).....	927	Westport, (M2)...	150
Lowry, (K3).....	90	Oacoma, (L6).....	201	Running Water, (O8)	100	Trojan, (B5).....	150	Wetonga, (M2)...	134
Loyalton, (L3).....	92	Oelrichs, (C7)....	194	Rutland, (P5)....	225	Troy, (R3).....	120	Wewela, (K7)....	125
Lyons, (R6).....	200	Okaton, (H6).....	150	Saint Charles, (L7)	150	Tulare, (M4)....	359	Wheeler, (R7)...	100
McIntosh, (G2)....	704	Oldham, (P5).....	404	Saint Lawrence, (M5)	343	Turton, (N3)....	265	White, (R5).....	521
McLaughlin, (H2)...	649	Olivet, (O7).....	197	Saint Onge, (B4)...	250	Twin Brooks, (R3)	157	Whitehorse, (G3)...	100
Madison, (P5).....	4,386	Onaka, (L3).....	157	Salem, (P6).....	1,104	Tyndall, (O8)....	1,370	White Lake, (M6)...	570
Manchester, (O5)...	140	Onida, (J4).....	632	Scenic, (E6).....	130	Unityville, (P6)...	100	White Owl, (E4)...	100
Manassfield, (M3)...	250	Orient, (L4).....	267	Scotland, (O7)....	1,186	Utica, (O8).....	160	White River, (H6)...	320
Marion, (P7).....	620	Ortley, (P3).....	171	Selby, (K2).....	568	Vale, (C4).....	125	Whiterock, (R2)...	319
Martin, (F7).....	100	Owanka, (D5)....	150	Seneca, (L3).....	259	Valley Springs, (R6)	403	Whitewood, (B5)...	300
Marvin, (R3).....	141	Parker, (P7)....	1,309	Sherman, (R6)....	193	Vayland, (M5)...	150	Willow Lake, (O4)	514
Meadow, (E2).....	200	Parkston, (N7)...	1,305	Sinai, (P5).....	230	Veblen, (P2)...	524	Wilmot, (R3)...	567
Meckling, (R8)...	190	Peever, (R2).....	262	Sioux Falls, (R6)...	30,127	Verdon, (N3)...	81	Winfred, (P6)....	310
Mellette, (N3).....	459	Philip, (F5).....	708	Sisseton, (P2)....	1,468	Vermilion, (R8)...	3,410	Winner, (K7)....	2,203
Menno, (P7).....	937	Piedmont, (C5)...	100	Sorum, (D3).....	100	Viborg, (P7).....	709	Witten, (J7).....	221
Midland, (G5).....	240	Pierpoint, (O3)...	432	South Shore, (R3)...	299	Vienna, (O4)....	425	Wolsley, (M5)...	454
Millbank, (R3)....	2,444	Pierre, (J5).....	3,560	South Sioux Falls,		Wood, (R7).....	131	Woonsocket, (N5)...	1,203
Miller, (L4).....	1,528	Plankinton, (N6)...	803	(R6).....	256	Vilas, (O6).....	182	Worthing, (R7)...	274
Mina, (M3).....	150	Platte, (M7).....	1,393	Spearfish, (B5)...	1,349	Virgil, (N5)....	300	Yale, (N5).....	184
Miranda, (M4)....	125	Pollock, (J2)....	501	Spencer, (O6)....	599	Vivian, (J6)....	304	Yankton, (P8)....	5,507
Missionhill, (P8)...	189	Presho, (J6).....	537	Springfield, (N8)	689	Volga, (R3).....			
Mitchell, (N6)....	10,119	Fukwana, (L6)....	381	Stamford, (G6)...	150	Volin, (P8).....			

QUESTIONS ON SOUTH DAKOTA

(An Outline suitable for South Dakota will be found with the article "State.")

What white men first saw South Dakota? What did they seek?

How many states are larger than South Dakota? How many of these larger states have a greater population?

Where are the Black Hills located with respect to the Cheyenne River?

What and where are the Bad Lands? For what are certain portions of this region useful?

Where, so far as is known, is the richest hundred square miles in the world? What makes it so?

Which had a constitution first, North Dakota or South Dakota?

How many states entered the Union between the close of the Revolution and the entrance of South Dakota?

What are some of the scenic features of the Black Hills region?

Is the loftiest point in South Dakota higher or lower than that in each of the states upon which it borders?

What is the difference in the way water for irrigation is obtained in the eastern and in the western sections of the state?

Of how many territories has the South Dakota region formed a part?

What Indian chiefs were most famous in the history of this region?

What advanced theories have been put into practice in the penal system of the state?

What was the first steamboat on the Missouri? When did it reach the Dakota region?

How is the permanent school fund secured?

How does the state rank, as regards illiteracy, with others in the West North-Central group?

What is the chief mineral of the state?

Sketch a map of South Dakota showing the physical features and agricultural and mineral regions.

Show the relations between the agricultural and manufacturing industries.

How does the state compare in its number of Indian inhabitants with North Dakota? With Oklahoma?

Is the population largely rural or urban—that is, do more of the inhabitants live in the country or in the city?

How many constitutions has the state had?

What advanced legislation has been adopted?

What is the railway mileage to each hundred square miles of area? How does the state compare in this respect with the states that bound it?

What is South Dakota's popular name? What right has it to this name?

What does the proper name of the state mean?

How much below the highest point in the state is the lowest point?

What two famous soldiers took part in the engagements against the Indians in the Dakota region?

What famous mine is located in South Dakota?

What is the *chinook*?

In what enterprise has South Dakota shown its progressive attitude?

What is the value of the annual production of gold in the state?

What do you understand by the Homestake Lode, and how has its discovery affected the population and the prosperity of the state?

How have the socialist experiments of South Dakota resulted?

Who introduced domestic cattle into the state, and in what section do they thrive best?

What President of the United States spent a vacation in South Dakota?

frame a constitution, and in 1885 it applied for admission into the Union. In 1887 the proposition for the division of the territory into two states was approved by the voters. Two years later, the constitution of 1885, with slight changes, was adopted, and on November 2, 1889, South Dakota became the fortieth state.

The Indians were finally defeated by General Nelson A. Miles in the Battle of Wounded Knee, in 1890, and since that time their lands and reservations have steadily decreased in size.

In 1917 the state began a number of adventures in state socialism, which have been considerably modified in later years. Among these were a system of rural credits, through which many million dollars have been loaned to farmers, at the cost to the state; a state guaranty of bank deposits; a state coal mine; a state hail-insurance system; and a state cement plant. The state has discontinued its rural-credit system, and is closing out its loans; it has also repealed the law providing for the state guaranty of bank deposits.

The Republican party held control from 1909 to 1927, when a Democratic governor was elected, largely because of the unpopularity of the Republican candidate. The Democratic candidate for governor was the only Democratic state officer elected, and in 1929 he was re-elected, in spite of the Republican landslide for Hoover. For two years, 1923-1925, the state controlled the sale of gasoline, to prevent exorbitant prices, but the supreme court ruled that the policy could not be continued, and the state operates no stations now.

A national monument in the Bad Lands was established by vote of Congress in 1920. A new scenic highway through the region will make the way easy for motorists. C.W.P.

Related Subjects. The reader who is interested in the study of South Dakota will find much helpful material in the following articles:

CITIES AND TOWNS

The important towns in the state are listed on the back of the state map.

HISTORY

Custer, George Armstrong	Miles, Nelson A.
Lewis and Clark Expedition	North Dakota (History)
	Sitting Bull

LEADING PRODUCTS

Alfalfa	Meat and Meat
Corn	Packing
Dairying	Silver
Gold	Wheat

PHYSICAL FEATURES

Bad Lands	Minnesota River
Black Hills	Missouri River

SOUTH EQUATORIAL CURRENT. See OCEAN (Ocean Currents).

SOUTHERN CALIFORNIA, UNIVERSITY OF. See CALIFORNIA (Education).

SOUTHERN CHINESE REPUBLIC. See SUN YAT-SEN.

SOUTHERN COLLEGE. See LOUISIANA (Education); FLORIDA (Education).

SOUTHERN CROSS, a famous constellation in the southern hemisphere, so called from the outline formed by its four brightest stars. The southernmost star is of the first magnitude, the eastern and northern stars of the second magnitude, and the western star of the third (see MAGNITUDE). The four stars are not arranged in the exact form of a cross, and to distinguish the constellation is somewhat difficult for those who are not familiar with it. The upper and lower stars, forming the upright of the cross, are the pointers to the South Pole. This constellation is by no means as splendid as many constellations in the northern hemisphere, and is usually considered disappointing when seen for the first time. The constellation is also called *Crux*. F.B.L.

SOUTHERN MOSS. See AIR PLANTS.

SOUTHERN UNIVERSITY. See LOUISIANA (Education).

SOUTHEY, *south'ih*, ROBERT (1774-1843), an English poet and prose writer, associated with Wordsworth and Coleridge in the Lake School of English poetry (see LAKE SCHOOL). He was born at Bristol, but during most of his boyhood, he lived with an aunt at Bath, having at an early age lost both parents. He studied at Westminster School, from which he was expelled for writing a satire on flogging, and at Oxford, where he remained only two years. In 1794, with Coleridge and Lovell, he planned a socialistic colony, or "pantisocracy," to be founded in America, but the scheme was never carried out. In the following year, he married Edith Fricker, a sister of the lady who later became Coleridge's wife, and soon afterward went with his uncle to Portugal.

After his return to England, Southey established himself with his wife at Keswick, in the Lake District. Here he devoted himself to study and to the production of his numerous and varied writings, working always with great diligence. In 1807 the government granted him a pension of £160 a year, which was later increased to £300. The income from his books was also considerable. Early in his life, Southey had been a pronounced radical in politics, as in religion; as he grew older, he became more and more conservative, and in 1813, when he was appointed poet laureate, he was a staunch Tory. In 1837 his wife died, after a period of insanity, and two years later he married Caroline Bowles. Soon after his second marriage, his mind began to weaken, and he did not recover from the ailment.

Southey is to-day ranked higher as a prose writer than as a poet. Indeed, in his own day, Byron, one of the sharpest critics of his poetry, said, "Southey's prose is perfect." Prose was his natural medium of expression, and he himself felt that he was scarcely justified in put-

ting his thoughts into verse, though some of his poems were popular.

His Poetry and Prose. Among his poems are *Joan of Arc*; *Thalaba, the Destroyer*; *Madoc*; *The Curse of Kehama*; and *Roderick, the Last of the Goths*, all narratives based on legends and myths. He also published *Vision of Judgment*, written in honor of George III. Some of his prose writings are a *History of Brazil*, a drama entitled *Wat Tyler*, the *Letters from England* by Don Manuel Alvarez Espriella, *The Doctor*, and biographies of Nelson, Wesley, and Bunyan. In *The Doctor* appeared an old folk tale—the story of *The Three Bears*.

SOUTH GEORGIA. See FALKLAND ISLANDS.

SOUTH GEORGIA AGRICULTURAL COLLEGE. See GEORGIA (Education).

SOUTH ISLAND. See NEW ZEALAND.

SOUTH MAGNETIC POLE. See MAGNET AND MAGNETISM.

SOUTH ORKNEYS. See FALKLAND ISLANDS.

SOUTH PLATTE RIVER. See COLORADO (The Rivers).

SOUTH POLAR EXPLORATION. See POLAR EXPLORATION.

SOUTH POLE. See POLE.

SOUTH SEA COMPANY. See WALPOLE, ROBERT.

SOUTH SEA ISLANDS, not a recognized geographical term, but a common name applied to the vast number of islands which dot the Pacific Ocean. See PACIFIC ISLANDS.

SOUTH SHETLANDS. See FALKLAND ISLANDS.

SOUTH VICTORIA LAND. See ANTARCTIC LANDS AND SEAS.

SOUTHWEST AFRICA, from 1884 to 1915 known as GERMAN SOUTHWEST AFRICA, lies between Angola and the Union of South Africa, on the north and south, and between Bechuanaland and the Atlantic Ocean, on the east and west. The area of this former German colony—322,393 square miles, or more than twice the area of California—remained unchanged when it was transferred to the mandate of Great Britain, at the close of the World War. However, for administrative purposes, the region to the northeast, comprising 10,573 square miles and known as Caprivi Zipfel, was assigned to the Bechuanaland Protectorate, another British colony. The population in 1926 was about 234,790, including about 24,000 Europeans.



LOCATION MAP

Among native races, the Hottentots and Bushmen are important.

Germany began to take possession of this region in 1884. The boundaries of the colony were fixed by treaty with England and Portugal, in 1890. In 1903 a Hottentot tribe revolted, and the following year the powerful Herero nation rose in rebellion. This revolt was only subdued after three years of very stubborn fighting.

German Southwest Africa was conquered by British troops from the Union of South Africa in July, 1915, a little less than a year after the beginning of the World War. The territory became officially Southwest Africa, sometimes referred to as the Southwest Africa Protectorate; and in 1920 it was placed under control of the Union of South Africa by mandate of the League of Nations. The laws of the Union, which may be modified to meet local conditions, have been introduced. The capital is Windhoek, centrally located and connected by rail with the coast at Walvis Bay; its population was estimated in 1926 to be 15,000, including 4,600 white people. There is another railroad southward into the Union of South Africa, and it also extends to the Atlantic, at Luderitz Bay.

Description and Resources. The coastal zone, extending inland about sixty miles, is sandy and barren, and is bordered by a wide belt of highlands, which rise gradually to an altitude of 3,000 to 6,000 feet. A small portion of the eastern section is a sandy desert, forming part of the great Kalahari Desert, but there are large areas of good grazing land.

The raising of sheep and cattle constitutes the chief source of wealth. Copper is mined, and since 1908 diamonds have been the chief export; they are found along the coast northward from Orange River. In 1920 large fields of nitrate of soda were discovered. Gold, lead, vanadium, silver, and other minerals have also been found. The other chief exports consist of wool, hides, horses, ivory, and ostrich feathers.

SOUTHWESTERN LOUISIANA INSTITUTE. See LOUISIANA (Education).

SOVEREIGN, *sov' ur in*, or *suw' ur in*, a current English gold coin, of the value of £1, and weighing 123.274 grains Troy. The sovereign is the standard monetary unit of Great Britain, its fineness being fixed at 916.66, or twenty-two carats. It was first issued by Henry VII in 1489; on its surface was stamped the figure of the king seated on the throne and dressed in his robes of state. At that time, the coin weighed 240 grains. When James I became king of the United Kingdom of England and Scotland, the sovereign was called a *unite*, to commemorate the union. Until 1816 Great Britain used both gold and silver as standards in its monetary system, but in

that year gold alone was made the standard (see BIMETALLISM).

George III chose the sovereign for the unit of currency, and it was first issued in its present form in 1817. Half sovereigns were also coined at this time, and two-pound pieces were authorized, but none were cast until after the death of George III. The standard weight of a sovereign is determined by that of 934½ sovereigns, whose weight is equal to twenty Troy pounds. The coin is made by alloying the gold with another metal, usually copper, in the proportion of eleven parts gold to one part alloy.

The sovereign is equal to twenty English shillings, and to about \$4.86 in the coin of the United States and Canada. See MONEY (Foreign Monetary Standards).

SOVEREIGNTY, the political condition of a state by which it has power to impose its will continuously, and without exception, upon all persons and matters within its jurisdiction. In other words, such a country knows no higher power than its own mandates.

The modern use of "sovereign" as applied to a state signifies that that particular country possesses the right not only to form its own laws and conduct its own internal and external affairs, but also has the right to declare war without reference to or consent of any other state. The separate states of the American Union cannot properly be regarded as sovereign states, for, while possessing all of the attributes of sovereignty, so far as the conduct of their internal affairs is concerned, they cannot be regarded as absolutely independent with respect to external affairs affecting the whole of the United States. The sovereign power lies in the federation of states. The people are said to be sovereign in a democracy.

The modern conception of sovereignty differs from that of the French king Louis XIV, who said, "I am the State."

SOVIET, *so' vih et*, a Russian word meaning *council*, referring to the local administrative committees that were organized throughout Russia after the czar was deposed and his autocratic authority ceased. These local soviets, made up of representatives of workmen, soldiers, peasants, etc., became the real source of power in the country; their representatives formed the Central Soviet, which Lenin and Trotzky seized and used as the instrument by which they rose to power. The word has come into universal use, for, following the Bolshevik revolution of 1917, in Russia, the Union of Socialist Soviet Republics was formed, including Soviet Russia, officially termed the Russian Socialist Federated Soviet Republic; the Ukrainian Socialist Soviet Republic; the White Russian Socialist Soviet Republic; the Transcaucasian Socialist Federated Soviet Republic; the Turkoman Soviet Socialist Republic; and the Uzbek Socialist Soviet Republic.

Related Subjects. The reader is referred in these volumes to the following articles:

Lenin, Nikolai Russia Trotzky, Leon

SOW, the female hog (which see).

SOWING MACHINE, SEEDER, OR DRILL, a machine for planting seed. At one time, hand sowing was the universal practice; the seed was taken out of a bag hung from the neck or carried over the arm, and scattered broadcast or dropped into hills or furrows. Along with other farm labor-saving devices, machines for opening the ground, depositing the seed, and covering it, have come into general use.

Corn requires a special type of planter; first, because of the size of the kernels, and second, because corn is usually planted in rows about three feet six inches apart, on the average, and the kernels are either dropped singly in the row spaced some six to eighteen inches apart, or else dropped in hills of two to four, usually three feet six inches apart. When dropped in hills, the machine is commonly used in connection with a wire stretched across the field. This wire has knots or buttons spaced three feet six inches apart on it, and operates in such a way as to cause the hills to be dropped so that they are lined up crosswise, as well as the way the rows are being planted. This method permits of cultivating up and down the rows and across the rows.

For small grains, the drill or seeder now in use consists of a narrow chest or box six to fourteen feet long. The grain is fed out of the bottom of this box by means of specially designed feeding devices commonly called *seed cups*. These devices are usually spaced six, seven, or eight inches apart, and two types are in general use. One is called the *fluted wheel*, and consists of a corrugated wheel operating in a throat in the bottom of the box. As this corrugated wheel turns, it carries grain out in the flutes to the outside and drops it. The quantity per acre is regulated by sliding the flute into or out of the throat. The more of the fluted wheel that is in the throat, the heavier the seeding. An adjustable lip at the end of the throat adjusts the seed cup for different-sized grain.

The other type of seed cup is called the *internal double run*. It is called *internal* because the grain is carried on the inside of the rim of a wheel, rather than on the outside, as in the case of the fluted wheel; and it is called *double run* because either side of the wheel may be used, and one side is larger than the other to accommodate larger seed. With this device, the rate of seeding is regulated by changing the speed of the seed cup with relation to the speed at which the drill is traveling over the ground.

This box, with the seed cups under it, is mounted on two wheels, one at each end. Steel

or rubber tubes extend from the seed cups to the furrow-opening devices at the ground. The seed is delivered through the furrow-opening device into the furrow. The common types of furrow-openers are the single- and double-disc openers, and the so-called *hoe*. The hoe type is but little more than a piece of pipe sawed off on the slant, with the pointed end to the front. The other two types throw the soil more than the hoe type, and therefore need some sort of a covering device for covering the grain. These types are therefore commonly equipped with a small wheel or chain, to cover the grain. These drills are drawn by two to four horses or a tractor, and, under ordinary conditions, one of them will plant from eight to forty acres a day, the acreage covered depending upon the size of the drill and the type of power being used. See AGRICULTURE (Use of Improved Implements).

As a general rule, horse-drawn machinery covers about two acres of land for each foot of width of the machine in a ten-hour day, and tractor-drawn tools cover three acres per day per foot of width. That is, a tractor-drawn drill ten feet wide would cover on the average about thirty acres per day.

F.W.D.

SOW THISTLE, one of a genus of weeds belonging to the composite family. Though native to Europe, several species have been introduced into the United States, where they have become nuisances in pastures and grain fields. The *common sow thistle* grows to be two or three feet tall, and has a branching stem, milky juice, and small yellow blossoms. In the north of Europe, the peasants use the tops and leaves of the plant as a potherb. The sow thistle can be eradicated only by careful cultivation and the planting of crops which will check its growth.

B.M.D.

Scientific Name. The botanical name of the common sow thistle is *Sonchus oleraceus*.

SOY. See RICE (Food Value).

SOY BEAN. See BEAN (Kinds).

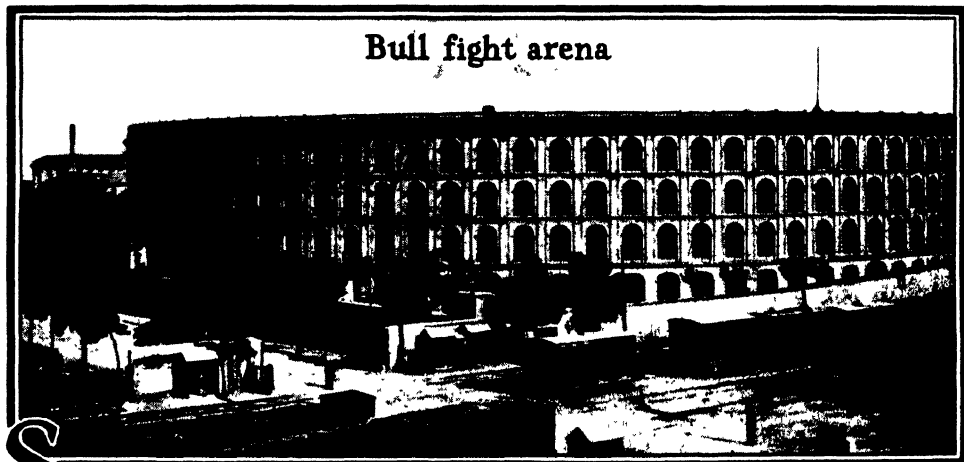
SPA, *spah*, a Belgian town noted for its baths. See BATHS AND BATHING.

SPACE AND TIME, CONCEPTS OF. See EINSTEIN'S THEORY OF RELATIVITY (Concepts of Time and Space).

SPACE-TIME. See EINSTEIN'S THEORY OF RELATIVITY (Concepts of Time and Space); GRAVITATION (Newton and Einstein).

SPAGHETTI. See MACARONI.

Bull fight arena



SPAIN, a kingdom of Southwestern Europe, a picturesque country of romantic traditions, with a civilization that is a curious blending of ancient customs, medieval grandeur, and modern ideas. It was under the flag of Spain that Columbus discovered America, and Spanish navigators played an all-important part in the exploration and settlement of the New World. In the sixteenth century, this kingdom was the most powerful nation in the world. Yet, of its numerous colonial possessions, which practically encircled the globe, none remain but small districts on the north and west coasts of Africa, and a few small islands in the Gulf of Guinea.

Size and Location. Having an area of 190,050 square miles, continental Spain is about twice the size of the state of Oregon. Including the Canary and Balearic islands, the area is 194,800 square miles. Spain occupies the greater part of the Iberian Peninsula. Its northwestern provinces border on the Atlantic, but the country is cut off from the ocean on the greater part of its western boundary by Portugal, and on the extreme south by the English fortress of Gibraltar, which is situated at the end of a long isthmus known as Neutral Ground. Spain's east coast forms the western boundary of the Mediterranean Sea, and on the north lies France.

The People and Their Customs. Southern Spain is a country of sunlit courtyards surrounded by picturesque balconies. Nearly every dwelling, from the meanest cottage to the most magnificent palace, has barred or latticed windows. Not less picturesque than their cities are the buoyant, gayly dressed people themselves. In the south they are of medium height and of dark complexion, the women being especially noted for their beauty,



LOCATION MAP

The southern point of Spain extends farther south than the most northerly point on the African coast.

dignity, and grace. The people of Northern Spain are usually blond, for they are of Celtic origin.

The Spanish are descended from the early Iberian inhabitants of the peninsula and the Roman and Teutonic invaders. The Basques of the north, numbering about 400,000, are more purely Iberian than the other inhabitants, and differ in language and customs. There are many tribes of gypsies scattered throughout the country. The total population of Spain, numbering 22,444,150 (census of 1920), is smaller than that of any other country having as old a civilization and equal natural resources. The most barren county of Ireland is not more scantily populated. The present population is less than one-half of that of the kingdom when in the height of its power. This decrease in population is due to the expulsion of the Moors, to the wars of the sixteenth and seventeenth centuries, and to the emigration which colonized South America.

Education. Spain's intellectual development has been slow, but new theories in education are gaining headway, and an awakening interest in learning reduced the rate of illiteracy from 63.78 per cent in 1900 to 42.88 per cent in 1920. The government is building new public schools at the rate of 1,000 each year, and experimental schools are making remarkable progress. Although compulsory education to the age of twelve was authorized in

1857, the law is still badly enforced. Public schools are maintained by local taxation and are under governmental inspection. There is at least one high school in every province. The high schools give preparation for the eleven universities of Spain, which are located at Barcelona, Granada, Madrid, Murcia, Oviedo, Saragossa, Salamanca, Santiago, Seville, Valencia, and Valladolid. The government also supports special schools, such as those of engineering, agriculture, music, and fine arts.

Religion, Language, and Literature. Spain still holds its reputation as "the most Catholic country in the world." It is a land famed for its houses of worship; the cathedral at Seville is one of the most magnificent of Christian churches. The Roman Catholic churches and clergy are supported by the state. There are numerous influential orders, but since 1910 the establishment of additional religious houses without the consent of the government has been prohibited. There are about 30,000 non-Catholics, of whom 7,000 are Protestants and 4,000 Jews.

The sonorous Spanish language is derived from the Latin. The Castilian dialect is the chief language of the country. The Catalan, which resembles the French, and the Gallego, which is more like the Portuguese, are spoken in the northern and eastern provinces.

The romantic songs and tales of the tenth century marked the beginning of the national literature of Spain. No other country is so rich in these heroic ballads, most of which celebrate the deeds of Charlemagne and the Cid (see *CD, THE*). Juan Ruiz is among the most distinguished of the early Romance writers, and Juan Manuel is noted as a prose writer of this early period. The greatest writers of the Golden Age of Spanish literature (1550-1650) were Caldéron de la Barca and Lope de Vega Carpio, the great poets and dramatists, and the famous Cervantes, author of *Don Quixote*, one of the world's masterpieces of fiction (see *VEGA CARPIO, FÉLIX LOPE DE; CERVANTES SAAVEDRA, MIGUEL DE*). During this period, Spain invented the picaresque novel; that is, one having for its hero a "picaro," or rogue. *Gil Blas de Santillana* was the masterpiece and model for this type of story, which was widely imitated in other countries.

The seventeenth century was a period of dramatic production, but in the next hundred years the national literature declined. During the latter part of the nineteenth century and early in the twentieth, the novel was the most prominent literary form in Spain. It reached its highest point of popularity in the work of Vicente Blasco Ibañez (which see, after 1915).

Art. Spain produced Velasquez, a painter who ranks with the greatest masters of the art; Murillo, who ranks also among the very great; and Zurbaran, El Greco, Goya, and

Zuloaga, all of whom are also famous artists. See PAINTING (Seventeenth Century).

Principal Cities

Unlike Italy, Spain has a large rural population and comparatively few important towns. The largest cities are the capital, Madrid, and Barcelona. These and other important cities are described below:

Barcelona, *bahr se lo' nah*, once the capital of the kingdom of Catalonia, and now capital of the province of Barcelona, is the most important commercial and industrial center of Spain, and has developed one of the few good harbors of the country. It is located on the northeastern coast of the Iberian Peninsula, commanding the Mediterranean. The old sections in the lower part of the city have narrow, crooked streets and remnants of ancient walls and fortifications which date back to the third or fourth century B.C., when Hamilcar Barca, the Carthaginian, founded the city, named it *Barcino* after himself, and established it as the Carthaginian stronghold on the peninsula. The modern sections of the city have broad avenues, beautiful homes, civic improvements, theaters, hotels, museums, thriving industrial and commercial establishments, and an air of prosperity.

On a hill in the center of the old town stands the cathedral of Barcelona, dating from the sixteenth century, and one of the finest examples of Spanish Gothic architecture. There are many other beautiful churches and public buildings, and in 1924 the Catalonians presented the Pedralbes Palace to King Alfonso, in an effort to induce the king to spend part of his time in Barcelona, in order to enjoy its splendid climate and beautiful environs. There is a fine public park at the north end of the city, containing well-planned flower gardens, lagoons, and several museums, most notable of which is the Museum of Reproductions. Barcelona is important as an educational center; the University of Barcelona was founded in 1430 and offers courses in practically every branch of learning. There are, in addition, a normal school, theological seminary, industrial schools, art academies, and several nunneries and monasteries.

Since about the twelfth century, Barcelona has been the leading city in Spain in commerce and industry. It has extensive cotton manufactures, other textile industries, principally those of wool and silk, and paper, glass, leather, and metal factories. During the World War, the city became very prosperous on the profits from the manufacture of war materials. The exports, which go chiefly to Great Britain, France, and the United States, are wines, fruits, metal manufactures, glassware, and pottery.

The city has excellent railway communications. In 1924 there was opened the first subway, and the following year a branch of the Metropolitan Railway, which connects the northwestern suburbs. Many improvements have been made in the harbor, and a new dry dock has recently been built. In 1929 an International Industrial Exposition was held, in which particular emphasis was placed on electricity and its diversified uses in industry.

Barcelona was governed by its own count until the twelfth century, but was united with Aragon in 1151. In 1640, with the rest of Catalonia—of which it was formerly the capital—it placed itself under the French Crown, and twelve years later, it submitted

again to the Spanish government. In 1697 it was taken by the French, but was restored to Spain by the terms of the Peace of Ryswick, in 1714. During the Napoleonic Wars (1808-1814), Barcelona was occupied by the French, and since that period it has been the hotbed of republican ideas and revolutionary tendencies. There are frequent student uprisings, demonstrations by the syndicalists, and revolutionary activities, both political and economic. In 1925 a revolt in Catalonia became so serious as to necessitate martial law. As a result of demands made for popular participation in the government, the mayoralty and a number of other offices have been made elective. Population, 1927, 760,000.

Cadiz, *ka' diz*, one of the most important seaports of Spain, capital of the province of the same name, is located sixty miles northwest of Gibraltar on the Atlantic coast. It is believed to have been founded by the Phoenicians in 1130 B.C., and to be the oldest town in Europe. It is well built, strongly fortified, well paved, and is very clean. From the sea the city presents an imposing spectacle, its snowy, white-washed buildings apparently rising abruptly from the deeply blue water.

The chief buildings are the great hospital, the customhouse, the old and new cathedrals, the theaters, the bull ring, capable of accommodating 12,000 spectators, and the lighthouse of Saint Sebastian. The medical department of the University of Seville, a theological seminary, and commerce and art schools are located at Cadiz. Theaters, museums, and art galleries cater to the culture of the inhabitants. The Bay of Cadiz has a good anchorage and is protected by the neighboring hills. It has four forts, two of which form the defense of the grand arsenal, at La Carraca, four miles from Cadiz, where there are large basins and docks.

The Phoenicians of Tyre founded Cadiz in the early part of the twelfth century B.C., and called it *Gadir*, meaning *fenced city*. Wars with the native tribes forced them to call on Carthage for help in about the sixth century B.C., and as a result of this alliance, the city was annexed by the Carthaginians. The Romans possessed it next, and later the Moors. Alfonso X of Castile took it from the Saracens in 1262, and three centuries later, in 1596, the English occupied the town. Trade with the Spanish colonies in the eighteenth century brought the city many riches, but subsequent attacks by the French, and the general decline of Spanish commercial importance, were reflected in Cadiz, and its prosperity waned.

Cadiz has long been the principal Spanish naval station. Its trade is large, though not as great as formerly, when South America and West India commerce was active. The exports are mainly wine and fruit. Population, 1927, 78,000.

Cordova, or **Cordoba**, one of the ancient Moorish cities, and truly a city of the Middle Ages, with abundant evidence of its past glories, but little that is modern or progressive. It is situated on the banks of the Guadalquivir, eighty-six miles northeast of Seville. The old city streets are narrow, crooked, and in many parts dirty, but there is a more modern portion which shows little trace of the Moorish occupation. The cathedral is the most remarkable structure in the city, having originally been a mosque which has been altered from time to time, to make it conform to the requirements of a Christian church. Like most Spanish cities, Cordova conveys to the visitor an idea of languor. The city was once a great commercial center, but its importance has declined.

Population, at the height of its Saracen splendor, estimated at over 1,000,000; in 1927, over 81,000.

Granada, an old Moorish city more noted for its past glories than its modern attainments. It is in Southeastern Spain, forty miles inland from the Mediterranean, in the foothills of the Sierra Nevada range, at an altitude of 2,195 feet above sea level. It has narrow, crooked streets and a conglomeration of architecture chiefly reflecting the Oriental influence of the Saracens, who made this city their capital and center of wealth and learning. The types of buildings range from the none-too-clean hovels of the poorer classes to the beautiful Alhambra palace, and here and there are Moslem churches which have been remodeled for Christian worship.

The picturesqueness of the city cannot be denied; one seems in a different world and transplanted to another age. The gay costumes of the inhabitants, the occasional glimpse of a gypsy, the ever-present ruins, all of which might tell us an interesting and probably romantic tale, and the apparent apathy of the people, who leisurely enjoy the delightful climate with little evidence of ambition and no undue energy, constitute the ensemble which makes up Granada, and inspires even the owners of sordid cafés of Western cities to name their resorts for this dilapidated yet romantic Moorish city.

The city has many sections and suburbs; the Darro River sets off some of the suburbs from the modern part, which lies to the north. Gardens, promenades, and fountains of the Moorish days have been preserved. Near the colorful Alhambra, a little to the north of the city, is another Moorish palace, the Generalife, a summer home for the Moslem princes. There are many educational and charitable institutions, and the university was founded four hundred years ago. The cathedral, which was under construction from 1529 to 1703, is symbolic of the Christian supremacy over the Saracen, and occupies the very ground of the principal Moorish mosque. In the Royal Chapel of this cathedral are the tombs of Ferdinand and Isabella, who conquered the independent province of Granada in 1492, after a ten years' struggle, and drove the Moors from their last European stronghold.

The city, founded by the Moors in the eighth century, reached the height of its power in the thirteenth century. During this period, its population was over 400,000, but after the surrender to Spanish rule, slow decay began. What few manufactures there are consist of textiles, paper, leather, macaroni, and chocolate, and some trade is carried on with the surrounding towns. The Madrid, Granada & Algeciras Railway provides transportation facilities. Population, 1927, 107,000.

Madrid, *ma drid'*, the capital city, situated on a high plateau, 2,150 feet above the sea, lies almost equidistant from the Mediterranean, the Atlantic, and the Bay of Biscay; in traveling distances, it is about 1,330 miles west of Rome and about 901 miles southwest of Paris. The climate, owing to the altitude and general location, is subject to disagreeable extremes of heat and cold. Although chroniclers trace it back as far as the tenth century, when it was a fortified post on the frontier of the Moorish kingdom of Toledo, Madrid is a very modern city, with but few landmarks of its medieval days.

The Puerta del Sol, a beautiful public square, is located in the center of the business district, and from it all the principal streets branch, like the spokes in a wheel. To the east lies one of the most beautiful

boulevards in the world, the Prado, lined with stately trees and made interesting by fountains, memorials, and statues. To the west is the Royal Palace, a magnificent granite building planned by Philip V, and containing many costly paintings, statues, and decorations; it is surrounded by vast grounds and gardens. Another impressive structure is the National Library and Museum, which was completed in 1892 and ranks with the best in the world. The Royal Armory, with its famous collection of rare arms—a reminder of the former glories of Spain; the National Museum of Painting and Sculpture, containing masterpieces of Velasquez, Murillo, Raphael, Rubens, and Van Dyck; and the Marine Library and a number of others make Madrid a cultural center of particular interest to the traveler and scholar. The University of Madrid is one of the largest of Europe, with faculties of the arts, music, engineering, commerce, education, and science.

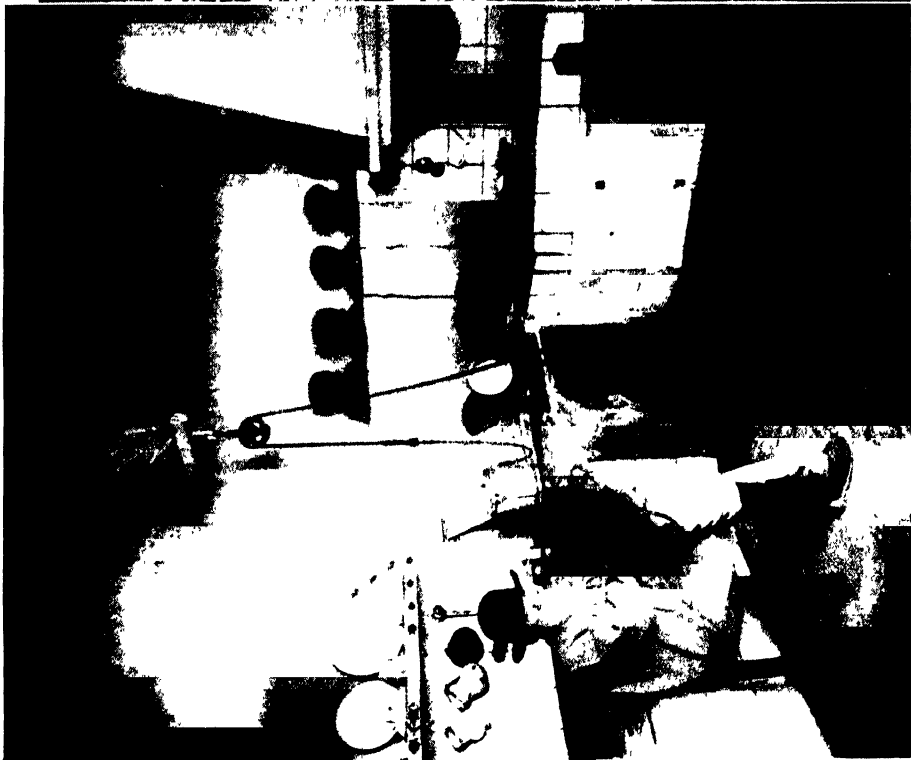
Madrid has an opera house, one of the most beautiful in Europe. The bull ring, the Plaza de Toros, is of Moorish architectural design and has a seating capacity of 13,000. The public utilities of the city are progressing with the population, new reservoirs have been constructed to supply the additional demands for water, and in 1924 the first underground railroad in Spain was completed. In 1925, \$425,000 was appropriated by the Rockefeller Foundation for a school of chemistry and physics. A new cathedral was built on the site of the old church in the Calle de Bailen, and an Anglican church was erected. Many other new and modern buildings, which have been recently added, give Madrid a twentieth-century air.

It is the railroad and distributing center of Spain, and though, until recently, manufactures have been of little consequence, rapid development is taking place. There is a national tobacco factory, besides manufactories of jewelry, leather, fans, umbrellas, chemicals, and liquors. The publishing trade is important; the old tapestry factory still does beautiful work, and the potteries at Moncloa are producing clever imitations of the earthenware for which Spain was once renowned. Population, 1927, 808,000.

Malaga, *mah' lah gah*, one of the most important seaports, is situated in the extreme south of the country, on the Mediterranean Sea, sixty-five miles northeast of Gibraltar. A Moorish castle, built in the thirteenth century, and similar Moorish landmarks in the older parts of the town, stand out in marked contrast to the imposing modern structures in the new quarters.

Because of its mild and uniform climate, Malaga has become famous as a resort for invalids. The Alameda, a beautiful boulevard, and other attractive residential districts have been laid out near the shore line. Though the city's trade has shown a decline in recent years, due to unscientific methods of agriculture and insufficient means of communication, olives, olive oil, wine, raisins, lead, almonds, lemons, grapes, and esparto grass are exported annually in large quantities. Manufacturing has been given renewed impetus, and there are thriving establishments for making cotton and linen goods, artistic pottery, soap, chemicals, iron products, sugar, etc. Population, 1927, 158,700.

Murcia, *mur' shih ah*, a city in Southeastern Spain, lies in the midst of one of the most fertile and beautiful valleys of the country, on both banks of the Segura River, twenty-five miles west of the Mediterranean Sea. Promenades and pleasure gardens



Ancient and Modern Aspects. At left, a peasant of to-day in his home in Valencia. At right, an old aqueduct still standing at Segovia, built centuries ago, during Roman occupation of the country.

Photos: Keystone



Photo: U & U

HARD, BACK-BREAKING FARM LABOR

In the provinces of Northern Spain are regions of forests, farms, and scattered villages. The people there seldom travel, and only a very few read newspapers, for illiteracy is very widespread. Farm work is still done by hand; a reaping machine would be looked upon as a miraculous contrivance.

France by the Pyrenees, the highest summit of which is the Pico de Aneto (11,160 feet). Near the southern coast rise the lofty Sierra Nevada Mountains, whose culminating peak, Mulhacén (11,664 feet), is the highest in Spain and one of the loftiest in Europe.

The Atlantic coast is steep and rocky, and in its many fiordlike indentations are good harbors. The south and east coasts, however, are comparatively regular, the gentle curves projecting in a few prominent headlands. At Gibraltar the coast rises to precipitous rocky cliffs.

Rivers and Lakes. Four of the great rivers of Spain rise in the central table-land and empty into the Atlantic. The Tagus and the Douro flow west through Portugal; the Guadiana follows a southerly course along the Portuguese boundary; the Guadalquivir, the deepest, flows south through the olive-clad region of Andalusia, and is navigable for large vessels; the Ebro rises in the Cantabrian Mountains and flows east to the Mediterranean. It is the only navigable stream on the Mediterranean side.

There are numerous small mountain lakes, and in the barren steppes are many salt ponds,

but the only bodies of water of any size are three coast lagoons, the Albufera near Valencia, the Mar Menor of Murcia, and the Laguna de la Janda in Cadiz.

Climate. Every climate of the temperate zone is to be found in Spain. As great extremes of temperature as occur in any part of Europe are experienced in the central table-land. In this region the summers are very warm and almost rainless; however, nights are very cool, and sudden changes of temperature are frequent in all seasons.

In Andalusia, or South Spain, there is a subtropical climate. During the mild winter, vegetation is most luxuriant. The dry steppes and plains of the southeast coast are the warmest sections of the country, and are frequently swept by the "solano," a withering and scorching wind which sometimes blows for two weeks. The northwest provinces on the Atlantic seaboard have a climate equable and moist as that on the western coasts of England and Scotland.

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stretching along the river banks, the luxuriant vineyards and mulberry, fig, and olive groves of the fruitful valley, lend charm and interest to the city. Murcia has been successively under the control of the Romans, Moors, and Spaniards, and one may still see traces of its former days in a few narrow streets with their quaint balconied houses. The most interesting feature of the place is the great cathedral, in Gothic-Romanesque style, begun in the fourteenth century. Although there is a thriving trade in grain and fruit, silk-making is the most important industry. Population, 1927, 152,900.

Saragossa, *sahr a gos' ah*, or **Zaragoza**, *thah' rah-go' thah*, a prosperous commercial city in the north-eastern part of the kingdom, situated on the right bank of the Ebro River, 212 miles northeast of Madrid, on the site of an ancient town of the Iberians. The name of the present city comes from *Caesarea Augusta*, which the Emperor Augustus applied to the settlement in 25 B.C., when he made it a Roman colony. It was once the capital of the old kingdom of Aragon (see CASTILE AND ARAGON).

In respect to appearance, Saragossa is said to be the oldest and the newest Spanish city, for around the central portion, with its crooked lanes and dilapidated houses, has been built a modern section with fine, broad avenues and handsome homes and buildings. The city is important as a railroad center and as a center of trade for a fertile farming region. Population, 1927, 153,600.

Seville, *se vil'*, an important city, famed in poetry and song, is, situated on the Guadalquivir River, about sixty miles northeast of Cadiz, in the midst of a country of sunny vineyards and orange and olive groves. It is variously called "The White City on the Guadalquivir" and "Queen of Andalusia." It has an added fame in being the birthplace of Spain's two greatest masters of painting—Velasquez and Murillo.

For many centuries, Seville was the home of the Moors, and its architecture now presents a curious mingling of Moorish and Christian forms. In recent years, it has lost much of its picturesque Moorish atmosphere, apparent in the network of small, shaded streets, the quaint, balconied houses built around handsome courtyards and gardens, and the fine squares studded with fountains; for Seville has been enlarged and beautified in a modern sense.

Only a few remains are now visible of the wall of sixty-four towers, which once encircled the city. The greatest ornament of Seville is its cathedral, third largest in Europe, built in 1402-1519 on the site of a Moorish mosque. Near by are the Court of Oranges and beautiful Campanile, or bell tower, called Giralda, with its twenty-two sweet-toned bells. Another of the glories of Seville is the Alcazar, an ancient palace of Moorish kings. The bull ring has seating space for 12,000 people.

The Country and Its Industries

The Land. Spain is a country of contrasts, not only between the old and new civilizations, but in its natural features as well. It is a country of boundless plains and rugged sierras, of barren mountains and fertile valleys, of trackless and silent wastes and flourishing gardens, of the vine, olive, and orange. In the northwest provinces, bordering the Atlantic and the Bay of Biscay, there are fertile mead-

Although the city no longer lays claim to the title of "Spanish Athens," which it once so proudly bore, it is still an intellectual center. Next to Madrid it is the most flourishing city in art, literature, and university education in Spain. It is rapidly recovering much of the commercial prosperity which it enjoyed in the seventeenth century, when it was the chief mart of Spanish commerce, and has built up an extensive industry in the manufacture of cigars, pottery, silks, machinery, chocolate, perfume, iron products, and other commodities. Population, 1927, 215,000.

Valencia, *va len' shih ah*, the third city in population, ranking next to Madrid and Barcelona. It lies on the River Guadalquivir, in the midst of a fertile plain, three miles from the Mediterranean coast. Its ancient walls, originally built by the Romans, were torn down in 1871, and have been replaced by handsome boulevards; two gateways with picturesque towers are all that remain of the old fortifications.

The city is a mixture of Oriental civilization and that of the present age. There are rows of white dwelling houses in the Moorish style of architecture, and innumerable domes and towers roofed with gold, blue, and white tiles; many of the crooked, narrow streets have been replaced by broad avenues, and all modern sanitary improvements have been acquired. The city has many interesting structures dating from the thirteenth century to modern times. The university is now one of the foremost in Spain, and the municipal botanical gardens, outside the line of the old walls, are unsurpassed anywhere else in the country. The leading manufacturing enterprise of Valencia is the silk industry, but the place is noted also for the production of colored tiles, tobacco, textiles, and iron and bronze wares. It is an important railway center, and carries on a thriving export trade in oranges and other fruits. Population, 1927, 267,000.

Valladolid, *vahl yah tho leeth'*, an interesting old city, situated on the Pisuerga River, 102 miles northwest of Madrid. This city possesses historic and literary interest, for Columbus died there, and there Philip II was born; and from 1603 to 1606, it was the home of Cervantes, famous as the author of *Don Quixote*.

Valladolid has many attractive plazas, parks, arcades, cathedrals, and other structures, rich in ornamentation and picturesque courts and façades. Its thirteenth-century Church of San Pablo and the building containing the city offices rank among the world's finest examples of Gothic architecture. Its educational institutions include one of the oldest universities in Europe. The city was the capital of Castile and Leon during the latter part of the Middle Ages, and after the union of Castile and Aragon, it was the capital of Spain until superseded by Madrid, in 1560. Population, 1927, 78,500.

ows and fields of flowers, and dense forests of oak, beech, and chestnut. In the south there are rich sections of luxuriant tropical vegetation, but barren steppes, studded with a few fertile oases, border the southeastern coast.

Three-fourths of the peninsula is a treeless table-land 1,000 to 3,000 feet above the sea, enclosed by high mountains and broken by rough sierras. On the north, Spain is separated from



Photo: U & U

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remains uncultivated. In an attempt to encourage this industry, agricultural commissioners are at work in every province, and many agricultural institutions, including the royal school at Aranjuez, have been established. The large estates, formerly rented to tenants at high rates, have been divided and sold to the farmers with small capital. Following the World War, there were many changes in agriculture. Profits from war industries were invested in new agricultural machinery, large irrigation projects were inaugurated, and new and better methods of cultivation introduced.

Irrigation is necessary in the central and eastern districts and in parts of the northwestern provinces. The two most productive regions are in Valencia and Catalonia, where the land is carefully terraced, fertilized, and irrigated by a network of canals fed from reservoirs. Here, all of the available land is tilled, and large crops of oranges, lemons, grapes, and other fruits are produced. Rice is grown extensively in the swamps in Valencia. In the northwest provinces, the land is naturally more fertile and the rain more plentiful. In this section, European fruits are cultivated, and the cultivation of cereals, diversified farming, and stock-raising are important. In the valleys of Andalusia, olives, almonds, figs, pineapples, bananas, the date palm, and some sugar cane are grown.

The most important crops of the country are wheat, barley, rye, oats, grapes, and olives. Vines are grown in every province, and large quantities of wines, especially the famous Malaga and Alicante, and the sherry and tinto wines from Jerez de la Frontera, as well as grapes and raisins, are exported. The olive groves embrace hundreds of square miles, and from the cities of Seville and Cordova, Spanish olives and olive oil are sent to all parts of the world. The silkworm is extensively cultivated, especially in the south. Spain is noted for its fine horses and mules and its Merino sheep. Large flocks of goats, whose flesh and milk are favorite foods, are raised throughout the country.

Forests. The table-land and mountains of Central Spain are scantily supplied with trees, and in many sections the lack of timber is severely felt. The finest forests are in the West Pyrenees and Cantabrian mountains, and the most valuable trees are the cork oak and Spanish chestnut. Cork forests are also abundant in the southern mountains. Spain's output of cork exceeds that of any other country in the world; Portugal and Spain together produce almost three-fourths of the world's supply.

Minerals. Though the vast mineral resources of Spain are in an early stage of development, no other country of Europe produces as much copper, lead, and mercury. A large part of the mining has been done with

foreign capital, but perhaps in the future, Spanish enterprise may take advantage of this great natural wealth. Lead-ore, copper, and coal mines are scattered throughout the country. The famous mercury mines of Almaden were the richest in the world until the discovery of mercury in California. These and the salt works are the only mining industries owned by the government. Zinc, pyrites, manganese, cobalt, sulphate of soda, sulphur, and phosphorus are also found, and in 1915 deposits of platinum were reported.

Manufactures. The northwestern provinces, being nearer to the commercial centers of Europe, have the largest manufacturing industries. The chief manufactures—cotton goods, woollens, and laces—are centered in Barcelona. Linen and paper mills are also numerous in the northern provinces. The weaving of silk is growing in importance in the south, and there are a number of glassmaking factories. The manufacture of sugar is on the increase, and a few new iron and steel plants have been set up. Seville produces the greatest amount of cork products, but those of superior quality are manufactured at Barcelona. Although the protected market and the recent use of electricity and the water power of the mountain streams have increased manufactures, Spain's production falls far short of its needs and possibilities.

Transportation and Commerce. Spain is reached by Western tourists by way of Cadiz, or through the passes of the Pyrenees from France. There are over 10,000 miles of railroad, all owned by private companies. The gauge differs from that of the French line, making it necessary to change trains when the frontier is reached. In the larger cities, electric and motor cars make their way among the mule carts and ox teams, which are still the most common "carryall" in Spain. The roads have been greatly improved, more than 7,000 miles having been paved with concrete. Barcelona and Madrid have subway systems for rapid transit. There are commercial airlines between Madrid, Seville, and Lisbon; Toulouse, France, Casablanca, Morocco, and Alicante; Madrid and Barcelona.

Although Spain has twenty-one seaboard provinces bordering the Atlantic and the Mediterranean, the country is not important among the commercial nations of Europe. However, in recent years the merchant marine has been increased, and foreign trade is being revived. Much of the trade is with Great Britain, France, the United States, Germany, Argentina, and Cuba. Trade is protected by high duties, and since 1894 the United Kingdom has been the "most favored nation." The principal exports are wine, over 3,000,000 gallons of which go yearly to Great Britain alone; cork, metals, olives and other fruits, sugar, timber,

SPAIN



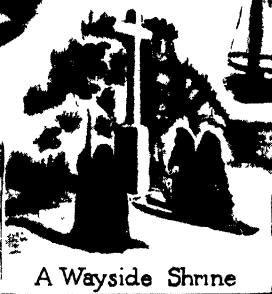
The Escorial



The Peasant's Transportation



Peasant Costumes



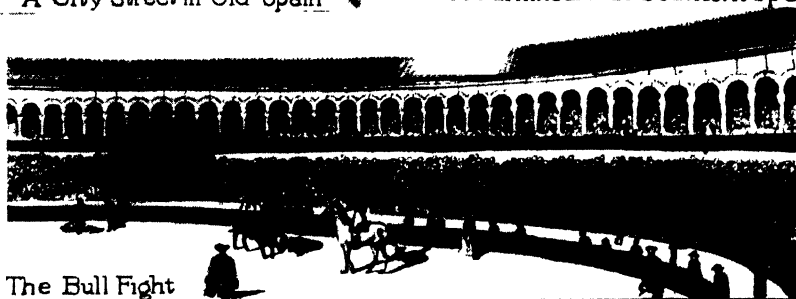
A Wayside Shrine



A City Street in Old Spain



A Farmhouse in Southern Spain



The Bull Fight

animals, glassware, pottery, wool, and cotton goods. Foodstuffs, livestock, machinery, coal,

raw cotton and linen, motor vehicles, and drugs and chemicals are imported.

Government and History of Spain

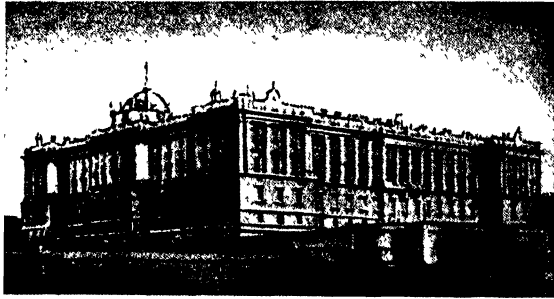
Government. Spain is a constitutional monarchy. According to the Constitution of 1876, the executive power was vested in the king and a Council of Ministers appointed by him. The monarch is inviolable, but the Ministers were responsible to the Cortes, and signed all of the king's decrees. The king had power to assemble, suspend, or dissolve the Cortes.

The legislative authority was vested in the king and the Cortes. The Cortes met annually, and consisted of the Senate and Congress of Deputies. There were 360 Senators, eighty of whom were hereditary, 100 appointed, and 180 elected. Half of the elective Senators retired every five years, and all retired whenever the body was dissolved by the king. The Deputies were apportioned according to population, one to every 50,000 people. Senators and Deputies had equal authority. Before 1924, voting was compulsory for all males over twenty-five years of age; they were required to possess full civil rights and to have been members of the municipality for two years. A new statute in 1924 regarding the administration of the municipalities reduced the voting age to twenty-three, and granted woman suffrage.

In July, 1929, a new Constitution was submitted to the members of the National Assembly for examination and study; in October it was submitted to the Assembly for debate and adoption or rejection. This proposed Constitution vests the executive power with the king, but he must consult responsible Ministers on important matters. He is to initiate all laws except those referring to government expenditures and income, which previously received the approval of one-fifth of the Deputies. The legislative power is entrusted to a single body—the Cortes—one-half of the members of which will be elected by universal suffrage; thirty will be appointed by royal decree, and the rest elected by special classifications. There will be one member of the Cortes to each 100,000 inhabitants of Spain, and women as well as men will be eligible to membership.

Local Government. Each commune has its own elected assembly.

Colonies. Of its once extensive colonial possessions, Spain now retains only Adrar and Rio de Oro, on the Sahara coast; Spanish Guinea and Ifni, also on the west coast of Africa; and the islands of Fernando Po, Annobon, and Corisco and the Elobey Islands, all in the Gulf of Guinea. The total area of these



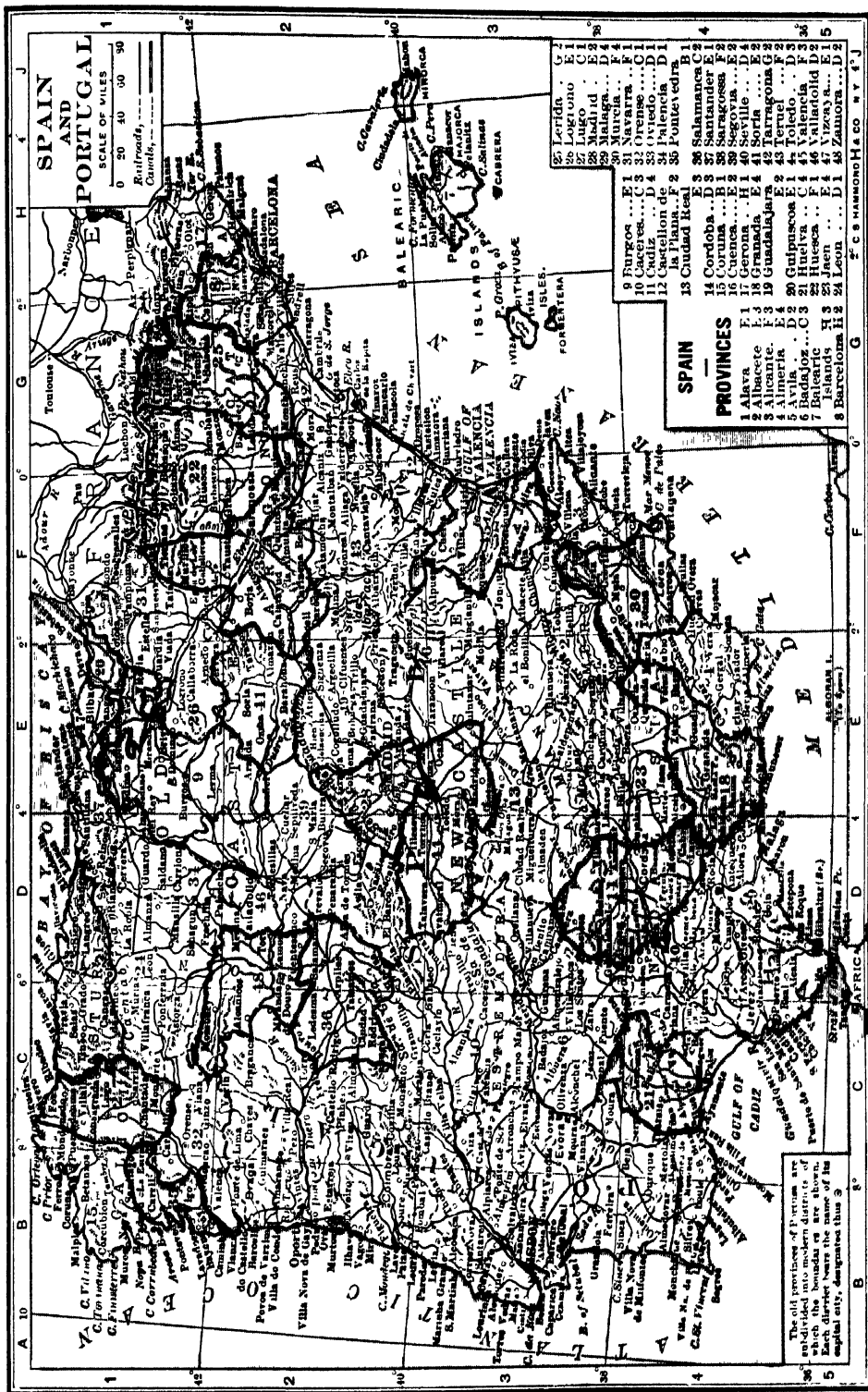
THE ROYAL PALACE
As it appears to-day.

possessions, including Spanish Morocco, over which Spain has a protectorate, is 128,666 square miles; the population is about 800,000. The Canary and Balearic islands are considered a part of Spain, and are under the central government. The colonial government of Spanish

Guinea and of the islands in the Gulf of Guinea is centered at Fernando Po. Rio de Oro and Adrar are under the government of the Canary Islands.

The Three Conquests of Spain. This ancient country, known to the Greeks and Romans as *Hispania* or *Iberia*, and inhabited by people they called *Celtiberians*, was colonized in the twelfth century before Christ by the Phoenicians. The first real conquest of the peninsula was made by the Romans when, in the Second Punic War, they defeated the Carthaginians and made Spain a Roman province. It was with difficulty that the Romans held their supremacy over the native tribes, and it was necessary for them to keep large armed forces in Spain. However, it became one of the most flourishing provinces of the empire and a center of Roman culture, producing many of Rome's greatest writers, including Seneca, Martial, and Quintilian. During the reign of Constantine the Great, Christianity became the dominant religion.

With the fall of the Roman Empire, Spain fell under the power of the three Gothic tribes: the Vandals conquered the south, naming it Vandalusia (now Andalusia), and the Suevi and Alans settled in Galicia and Portugal. By 573 the Visigoths had subjected these invaders and had conquered the whole peninsula. After a mastery of nearly two hundred years, they in turn were subjugated by the Moors in 711-712. The language and customs of the Arabs were introduced. Gorgeous palaces and fortresses, such as the Alhambra at Granada, and



SPAIN AND PORTUGAL

PORTUGAL

Aveiro, 11,523.....	B 2	Baza, 15,933.....	E 4	Huercal-Overa, 16,563.....	F 4	Ponferrada, 10,256.....	C 1
Beja, 10,113.....	C 4	Bermeo, 11,136.....	E 1	Huesca, 14,487.....	F 1	Pontevedra, 28,957.....	B 1
Braga, 21,970.....	B 2	Betanzos, 9,086.....	B 1	Igualada, 12,362.....	G 2	Pravia, 9,876.....	C 1
Ceimbra, 9,052.....	B 2	Belmez, 10,249.....	D 3	Luc, 9,894.....	H 3	Prior, Cape.....	B 1
Colimbra, 20,581.....	B 2	Berja, 11,256.....	E 4	Irun, 14,028.....	F 1	Puerto-Genil, 17,708.....	D 4
Covilha, 14,049.....	C 2	Bilbao, 115,014.....	E 1	Jasn, 33,402.....	E 4	Puerto de Santa Maria, 18,951.....	C 4
Douro or Dureo River.....	B 2	Bollitos par del Con- dado, 9,101.....	C 4	Jativa, 14,231.....	F 3	Puertollano, 20,118.....	E 3
Elvas, 10,645.....	C 3	Bujalance, 12,113.....	E 4	Jerez de la Frontera, 65,012.....	D 4	Pyrenean Mountains.....	G 1
Evora, 17,901.....	C 3	Burgos, 32,046.....	E 1	Jerez de los Caballeros, 13,526.....	C 3	Quesada, 8,771.....	E 4
Faro, 12,680.....	B 4	Burriana, 15,107.....	G 3	Jumilla, 20,340.....	F 3	Requena, 18,972.....	F 3
Guadiana River.....	B 3	Cabesa del Buey, 12,253.....	D 3	Lalín, 18,807.....	B 1	Reus, 30,486.....	G 2
Ihava, 12,700.....	B 2	Cabra, 13,925.....	D 4	Langreo, 34,486.....	D 1	Ribadesella, 9,173.....	D 1
Lisbon (capital), 489,667.....	B 3	Cabrera (island).....	H 3	Lavadores, 26,160.....	B 1	Roda, La, 9,234.....	E 3
Loule, 22,501.....	B 4	Caceres, 20,218.....	C 3	Lebrija, 12,068.....	D 4	Ronda, 30,622.....	D 4
Mondego, Cape.....	B 2	Cádiz, 76,137.....	C 4	Leon, 22,260.....	D 1	Rute, 11,515.....	D 4
Murtosa, 9,737.....	C 2	Cádiz, Gulf of.....	C 4	Lerida, 38,260.....	G 2	Sabadell, 37,074.....	G 2
Oporto, 203,981.....	B 2	Calatayud, 11,947.....	F 2	Linares, 40,479.....	E 3	Salamanca, 32,005.....	D 2
Ovar, 10,596.....	B 2	Campanario, 9,492.....	D 3	Linea, 61,078.....	D 4	Salas, 16,083.....	C 1
Portalegre, 1,603.....	C 3	Cangas, 12,974.....	D 1	Liria, 9,565.....	F 3	San Fernando, 27,316.....	C 2
Fovos de Vazim, 12,700.....	B 2	Cangas de Tineo, 24,075.....	C 1	Llanes, 24,999.....	D 1	San Jorge, Golfo de (gulf).....	G 2
Roca, Cabo da (cape).....	B 3	Cantabrian Mountains.....	D 1	Logrono, 28,207.....	E 1	Sanlucar de Barrameda, 27,150.....	C 4
Sabor River.....	B 2	Caravaca, 18,854.....	E 4	Loja, 20,522.....	D 4	San Roque, 11,204.....	D 4
Sado River.....	B 3	Carballino, 10,170.....	C 1	Lorca, 75,802.....	F 4	San Sebastian, 63,317.....	F 1
Saint Vincent, Cape.....	B 4	Carcagente, 14,041.....	G 3	Luarca, 26,215.....	C 1	San Sebastian, Cape.....	H 1
Santarem, 8,628.....	B 3	Carmona, 20,825.....	D 4	Lucena, 22,063.....	D 4	Santander, 73,072.....	E 1
Sao Bartolomeu de Mes- sines, 8,458.....	C 4	Carolina, 18,647.....	E 3	Lugo, 29,940.....	C 1	Santiago, 27,341.....	B 1
Setubal, 37,074.....	B 3	Cartagena, 101,613.....	F 4	Machichaco, Cape.....	E 2	Saragossa, 140,426.....	F 2
Setubal, Bay of.....	B 3	Cascais, 9,259.....	G 2	Madrid, (capital) 728,937.....	E 2	Sarria, 14,942.....	C 1
Silves, 9,687.....	B 4	Castellon de La Plana, 34,163.....	G 3	Mahon, 18,679.....	H 3	Segovia, 15,707.....	D 2
Sines, Cape.....	B 4	Cataluna (Catalonia) (ancient province).....	G 2	Majorca (island).....	H 3	Sevilla (Seville) 205,723.....	D 4
Tavira, 11,665.....	C 4	Cavalleria, Cape.....	H 2	Malaga, 150,258.....	D 4	Siero, 28,091.....	D 1
Torres Novas, 10,746.....	B 3	Cazalla de La Sierra, 9,682.....	D 4	Manacor, 13,113.....	H 3	Soller, 10,347.....	H 3
Vianna do Alemtejo, 9,851.....	C 3	Cazorla, 9,300.....	E 4	Mancha, La (ancient province).....	E 3	Sorbas, 8,081.....	E 4
Vianna do Castelo, 10,486.....	B 2	Cehugin, 13,801.....	E 4	Manresa, 25,928.....	H 2	Sueca, 18,050.....	F 3
Villa Nova de Gaya, 14,681.....	B 2	Cieja, 16,026.....	F 3	Manzanares, 15,891.....	E 3	Tagus River.....	C 3
Adra, 9,092.....	E 4	Ciudadela, 9,712.....	H 2	Marbella, 9,962.....	D 4	Tambre River.....	B 1
Aguilar, 14,911.....	D 4	Ciudad Real, 18,713.....	D 3	Marchena, 15,208.....	D 4	Tarazona, 8,335.....	E 2
Aguilas, 17,315.....	F 4	Ciudad-Rodrigo, 8,599.....	C 2	Mar Menor (inlet).....	F 4	Tarifa, 12,034.....	D 4
Albacete, 32,163.....	F 3	Coin, 11,642.....	D 4	Martos, 19,769.....	E 4	Tarragona, 28,009.....	G 2
Albarracin, Sierra de (mts.).....	F 2	Constantina, 13,451.....	D 4	Mataro, 23,726.....	H 2	Tarrasa, 29,188.....	H 2
Alboran Island.....	E 4	Cordoba, 72,641.....	D 4	Mazarron, 18,206.....	F 4	Ter River.....	H 1
Alcala de Henares, 12,241.....	E 2	Corrubeda, Cape.....	B 1	Medina del Campo, 10,441.....	D 2	Teruel, 11,834.....	F 2
Alcala de los Gazules, 9,947.....	D 4	Coruna, 63,603.....	B 1	Merida, 15,253.....	C 3	Tineo, 24,494.....	C 1
Alcala la Real, 17,242.....	E 4	Creventille, 11,339.....	F 3	Mieres, 38,921.....	D 1	Tobarra, 10,578.....	F 3
Alcaniz, 8,596.....	F 2	Cuenca, 12,965.....	E 2	Minas de Rio Tinto, 10,179.....	C 4	Toledo, 26,175.....	D 3
Alcaraz, Sierra de (mts.).....	E 3	Cuevas de Vera, 22,127.....	F 4	Minorca (island).....	H 3	Toledo, Mountains of.....	D 3
Alcira, 20,963.....	F 3	Cullera, 13,331.....	G 3	Mondonedo, 10,370.....	C 1	Tolosa, 11,031.....	F 1
Alcoy, 36,450.....	F 3	Chantada, 15,416.....	C 1	Monforte de Lemos, 14,420.....	C 1	Tomelloso, 21,353.....	E 3
Alhama de Murcia, 9,743.....	F 4	Chiclana de la Frontera, 12,014.....	C 4	Monovar, 10,521.....	F 3	Torinana, Cape.....	B 1
Alicante, 63,382.....	F 3	Daimiel, 16,259.....	E 3	Montijo, 9,351.....	C 3	Torreveja, 9,331.....	F 3
Almaden, 9,879.....	D 3	Dalias, 9,630.....	E 4	Montilla, 15,012.....	D 4	Tortosa, 32,405.....	G 2
Almagro, 8,765.....	E 3	Denia, 13,160.....	G 3	Montoro, 13,802.....	D 3	Totana, 14,221.....	F 4
Almendrales, 15,488.....	D 4	Don Benito, 21,059.....	D 3	Mora, 9,996.....	G 2	Trujillo, 11,528.....	D 3
Almeria, 51,034.....	E 4	Duero or Douro River.....	E 2	Moratalla, 13,477.....	E 3	Tudela, 10,511.....	F 1
Almeria, Bay of.....	E 4	Ebro River.....	G 2	Morena, Sierra (mts.).....	D 3	Tuy, 13,484.....	B 1
Almodovar del Campo, 11,973.....	D 3	Ecija, 29,031.....	D 4	Moron de la Frontera, 18,687.....	D 4	Ubeda, 22,808.....	E 3
Alora, 11,463.....	D 4	Elche, 33,187.....	F 3	Mula, 12,407.....	F 3	Utiel, 13,222.....	F 3
Ampostá, 9,048.....	G 2	Estepona, 10,076.....	D 4	Murcia, 142,480.....	F 3	Utrera, 20,800.....	C 4
Andalusia (ancient province).....	D 4	Estrada, 28,827.....	D 1	Murcia (ancient province).....	F 3	Valdepenas, 25,509.....	E 3
Andujar, 17,908.....	D 3	Estremadura (ancient province).....	C 2	Muros, 11,183.....	B 1	Valencia, 247,281.....	C 3
Antequera, 31,654.....	D 4	Felanitz, 11,708.....	H 3	Nao, Cape.....	G 3	Valencia, Gulf of.....	G 3
Aragon (ancient province).....	F 2	Ferrol, 30,782.....	B 1	New Castile (ancient province).....	E 3	Valladolid, 75,687.....	D 2
Arabal, 10,340.....	D 4	Figueras, 12,538.....	II 1	Noya, 11,815.....	B 1	Valls, 10,518.....	G 2
Aranjuez, 13,808.....	E 3	Fonsagrada, 19,861.....	C 1	Noya Bay.....	B 1	Valverde del Camino, 9,230.....	C 4
Archidona, 9,159.....	D 4	Formentor, Cape.....	H 3	Old Castile (ancient province).....	E 2	Vejer de la Frontera, 14,941.....	C 4
Arosa Bay.....	B 1	Fregenal de la Sierra, 10,792.....	C 3	Oliva, 9,117.....	G 3	Velez Malaga, 25,238.....	D 4
Asturias (ancient province).....	C 1	Fuente de Cantos, 10,514.....	C 3	Olivenza, 11,512.....	C 3	Velez-Rubio, 9,568.....	E 4
Avila, 13,098.....	D 2	Galicia (ancient province).....	B 1	Olot, 10,333.....	H 1	Vera, 7,491.....	E 4
Aviles, 14,331.....	D 1	Gallego River.....	F 1	Olvera, 11,342.....	D 4	Viana del Bollo, 9,339.....	C 1
Ayamonte, 13,214.....	C 4	Gandia, 12,893.....	G 3	Onteniente, 12,692.....	F 3	Vich, 13,019.....	H 2
Asuaga, 16,604.....	D 3	Gata, Sierra de (mts.).....	C 2	Orense, 18,365.....	C 1	Vigo, 53,614.....	B 1
Badajoz, 40,718.....	C 3	Gerona, 17,614.....	H 2	Orhuela, 37,368.....	F 3	Villacarrillo, 18,135.....	E 3
Badalona, 29,092.....	H 2	Gijon, 57,857.....	D 1	Ortega, Cape.....	B 1	Villafranca de los Barros, 12,994.....	D 3
Badena, 18,220.....	D 4	Grado, 19,878.....	C 1	Ortigueira, 21,661.....	C 1	Villafranca del Panades, 8,439.....	H 2
Badena, 14,917.....	E 4	Granada, 103,505.....	E 4	Osuna, 15,629.....	D 1	Villajoyosa, 9,757.....	G 3
Bailen, 8,853.....	E 3	Grota, Point.....	G 3	Oviedo, 70,096.....	C 1	Villanueva de Cordoba, 11,308.....	D 3
Balearcic Islands, 350,949.....	H 2	Guadalquivir River.....	C 4	Palencia, 20,016.....	H 3	Villarrobledo, 14,352.....	E 3
Barcelona, 705,901.....	H 2	Guadalupe, Sierra de (mts.).....	D 3	Palma, Bay of.....	D 1	Villaviciosa, 22,354.....	D 1
		Guadarrama, Sierra de (mts.).....	E 2	Palos, Cabo de (cape).....	F 4	Villena, 16,535.....	F 3
		Guadix, 16,151.....	E 4	Pamplona, 33,281.....	F 1	Vinaroz, 7,964.....	G 2
		Hellin, 18,743.....	F 3	Pera, Cape.....	H 3	Vitoria, 35,602.....	E 1
		Huelva, 34,160.....	C 4	Perdu, Mount.....	G 1	Vivero, 13,223.....	C 1
				Pithyusae Isles.....	G 2	Yecia, 25,486.....	F 3
				Plasencia, 10,016.....	D 3	Zamora, 18,185.....	D 2

the magnificent Moorish cities of Cordova, Toledo, and Valencia, were built. The country prospered and industries advanced.

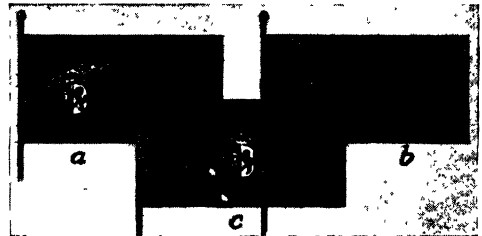
The Visigoths, driven into the north, had established the small independent kingdoms of Leon, Navarre, and Castile. The kingdoms of Galicia, Aragon, Murcia, and Portugal had been established as the result of the division of the small kingdoms among the sons of the kings. The civilization of Spain during this period surpassed that of most of the other European countries. In respect to education and improvements in agriculture and commerce, the Spanish kingdoms showed a high stage of development. In the thirteenth century, all of these Christian principalities united against the Moors, and the Moorish princes were subjugated by Castile, one of the most powerful of the small kingdoms.

The Union of the Independent Kingdoms. Aragon and Castile continued to develop, and in 1469 Ferdinand V of Aragon married Isabella of Castile. Ten years later, these two kingdoms were united, and the fusing of the many independent states into a political unity was begun. The history of the next hundred years, during the reigns of Ferdinand and Isabella, Charles V, and Philip II, is one of continued success and added glories. Ferdinand and Isabella used their royal prerogatives to the very last degree, and everything and everybody were subjected to their dictates. Hoping to gain Papal favor, the Catholic sovereigns determined to extend the Christian religion to all their people, and the horrors and excesses of the Spanish Inquisition followed. Functioning as a department of the royal government, the Inquisition ferreted out even the most remote suspicion of heresy, and exerted particular pressure on the Jews and Mohammedans in Spain. During the period of expansion, the Moors lost their last stronghold at Granada. The discovery of America, under the patronage of Isabella, extended the kingdom abroad. Mexico, Central America, Peru, Venezuela, Chile, Cuba, Jamaica, and Santo Domingo were acquired; conquests extended to Africa and to Malacca and the Spice Islands in Asia; and, with the acquisition of the Philippines, the Spanish Empire girdled the globe. The European conquests included Navarre, Roussillon, Portugal, the Netherlands, Naples, Sicily, Sardinia, the Canaries, and the Balearic Islands. Spain had become "the mistress of the world and queen of the ocean."

The Decline of Power. Spain's glory did not last long. In 1588 the naval supremacy of the kingdom was lost to England, when the famous Armada was shattered. In the seventeenth century, under Philip III, Philip IV, and Charles II, insurrection, religious persecution, bankruptcy, and civil war weakened the kingdom. The Netherlands were lost [see NETHER-

LANDS, THE (History)]. At the close of the War of the Spanish Succession (see SUCCESSION WARS), Spain had to relinquish Naples, Parma, Sardinia, and Milan to Austria, Sicily to Savoy, and Gibraltar and Minorca to England.

Relations with England and France. A short period of prosperity followed, but at the close of the eighteenth century, Spain unfortunately entered the war against the French republic, losing Santo Domingo to France. An alliance was then made with France against England, but the British victory at Trafalgar, October, 1805, permanently destroyed the Spanish naval power. Napoleon later conferred the Spanish throne upon his brother Joseph, and war with France followed. Napoleon victoriously entered Madrid, December 4, 1808, but French occupation of Spain met with more persistent resistance than Napoleon calculated—a condition which caused the rest



THE FLAGS OF SPAIN

(a) Warship; (b) merchant marine; (c) mail.

of Europe to doubt his insuperable power, and probably gave the first hint as to his ultimate failure. Believing his position to be secure in Madrid, Napoleon departed, to continue his conquests in the provinces.

Joseph Bonaparte was desirous of building up an independent empire which he would rule, but his brother fully intended to annex this peninsula to his own already vast territory. A Cortes, or Congress, was held in 1810 to proclaim allegiance to the new king, Joseph, and to give formal sanction to his laws and decrees, which formed practically a new Constitution, promulgated in 1812. Most notable of these changes were the suppression of the Inquisition, secularization of Church lands, abolition of feudal rights, and other regulations curtailing the power of the Church. The Spaniards submitted to these reforms not because they approved of them, but because many years of domination by the Church had accustomed them to obedience; further, the leaders firmly believed that the invaders would soon be routed, and that this new Constitution could then be laid aside. It was the support of Great Britain which enabled Spain to throw off Napoleon's rule. The Peninsular War, which occupied Spain, Portugal, and Great Britain against Napoleon from 1807 to 1814, had up

to 1810 made more progress in Portugal than in Spain. Napoleon had left a large army under Masséna in Spain, hoping to keep the British back, and if possible to force them out of Portugal. However, the Duke of Wellington and his men were at hand to prevent this contingency, and Wellington's consistent victories, aided by the Spanish troops, were responsible for French defeat in Spain, which was complete by the end of 1813.

The Spanish king, Ferdinand VII, was restored to his throne in March, 1814, and the Constitution of 1812 was immediately revoked. During the struggles to save Spain from foreign domination, its colonies in the New World were revolting. Uruguay, Paraguay, Chile, Venezuela, and New Granada one by

one threw off Spanish control. These losses, together with the despotism of the incapable and weak king, caused a military revolt which spread from a mutiny in Cadiz. The Inquisition and special privileges and powers of the clergy were abolished, the king was made a prisoner, and general anarchy and disorder reigned. The rest of Europe looked upon this civil strife not only as dangerous to Spain, but to the rest of the world as well. Alexander I of Russia had proposed intervention, only to be opposed by Great Britain and Austria, which foresaw danger to themselves.

Later, at the Congress of Verona, France sought permission to send troops to settle the internal difficulties, and, mindful of the previous activities of the French in Spain, England objected. Nevertheless, in 1823 the Duke of Angoulême entered Spain with his troops, and succeeded in restoring order in a short time. No sooner was Ferdinand back in power than he again repealed all liberal measures, and again attempted to set up the old order of bigotry and autocracy in Spain. The next few decades saw Spain torn between the conservative and cleric ideas of the king and Church and those of the liberal and progressive element.

Ferdinand died in 1833, and at his request his daughter Isabella took the throne, with her mother, Maria Christina, as regent. Christina soon saw that she must seek her support from the liberals, for the clerical party, which called

itself Carlist, championed Charles V as its candidate for the throne, and threatened to overthrow her. The queen regent was compelled to institute parliamentary reforms to retain her liberal following, for the intrigues of the Carlists were closing in upon her. This situation became so distasteful to her that, in 1840, she resigned the regency in favor of the liberal Espartero.

In 1868 Queen Isabella was forced to abdicate, in the midst of insurrection and revolt, and a provisional government was established. In 1870 the Assembly voted to make Spain again a monarchy, but, with the royal family banished, a ruler was sought in other countries. An Italian prince, Amadeo of Savoy, was elected, ruled two years, and resigned in 1873. After



THE FORMER DICTATOR AND THE SOVEREIGN

At the left, General Primo de Rivera, dictator, 1924 to 1930; succeeded by General Berenguer. At right, King Alfonso XIII a benevolent ruler, popular with his subjects.

an interval of republican government, Don Alfonso, the son of former Queen Isabella, was proclaimed the king of a new constitutional monarchy.

Recent History. In 1886 Alfonso XIII succeeded to the throne, with Maria Christina, his mother, as regent. The rebellion in Cuba brought about the intervention of the United States, and resulted in 1898 in the Spanish-American War. Porto Rico and the Philippines passed under the control of the United States. Cuba was made a republic. In the years that followed, Alfonso XIII did much to build up his exhausted country, but a grave political and economic crisis was caused by the increase in food prices resulting from the World War. The country was divided in feeling during the war, but both the pro-Germans and pro-Allies were agreed that Spain should remain strictly neutral.

Spain has suffered numerous local strikes and revolutions. As a result of a general railway strike, in July, 1916, all of the country was placed under martial law, and there was even a more serious crisis in the summer of 1917. Late in 1918, demands were made for home rule in Catalonia. In 1919 a general strike in Barcelona forced another change of Ministry, which the unsettled conditions of the country had made a common occurrence. In 1921 Spain attempted to retrieve at least a shade of its former colonial empire by an expedition into Morocco, but the Riffian tribes

OUTLINE AND QUESTIONS ON SPAIN

Outline

I. Position

- (1) Latitude, 36° to 44° north
- (2) Longitude, 9° 15' west to 3° 20' east
- (3) Boundaries

II. Size

- (1) Actual
- (2) Comparative
- (3) Dependencies

III. The People and Cities

- (1) Population
- (2) Racial elements
- (3) National characteristics
- (4) Education and religion
- (5) Language and literature
- (6) Principal cities

IV. Physical Features

- (1) The great table-land
- (2) Mountain ranges
- (3) Coastal characteristics
- (4) Rivers
- (5) Lakes
- (6) Influence of physical features on climate

V. Industries and Transportation

- (1) Agriculture
 - (a) Government encouragement
 - (b) Irrigation
 - (c) Chief crops
- (2) Forestry
 - (a) The cork industry
- (3) Vast resources
- (4) Manufacturing
- (5) Railroads and highways
- (6) Trade conditions

VI. Government

- (1) Constitutional monarchy
 - (a) Executive
 - (b) Legislative body
- (2) Colonial government
- (3) Army and navy

VII. History

- (1) The early conquerors
- (2) The Visigoths and the Moors
- (3) Development of an independent, unified kingdom
- (4) Decline of power and loss of colonies
- (5) Napoleonic era
- (6) Later nineteenth century
- (7) Spanish-American War
- (8) Later history

Questions

In what sense may Spain be called "a country of contrasts"?

What did the Greeks call this country? What part did Rome play in its early history?

Who is the best-known of Spanish writers, and for what is he famous?

Describe the processes by which the chief product of Spain's forests is secured and prepared for market.

In what sense has Spain a "responsible" government?

How does the area of the colonial possessions compare with that of Spain itself?

When and for how long was Spain a republic?

Give three causes for the decrease in population in Spain.

In what part of the country would you rather spend the winter? Why would you not care to spend the summer in the same place?

When, how, and to whom did Spain lose its position as "queen of the ocean"?

What is the chief sport of the country? Why is it frowned upon by other nations? Describe it.

What part of Spain belongs to Great Britain? How long has it belonged?

How did a king and queen of this country influence the history of America?

What is the Neutral Ground in Spain? What does it connect?

Tell the story of Rivera's dictatorship.

Who are the Riffs?

pushed the overwhelmed Spanish troops back in a decisive defeat which shook the entire country politically.

The campaign had been expensive in men and money, and investigations were made to fix the blame. Maladministration and lack of supplies and equipment were the charges made by the commission, and, added to this disturbing influence, Spain was further affected by the trend of dictator governments which were being carried on successfully in Italy, Poland, and elsewhere. In 1924 the breaking point was reached, and Primo de Rivera, captain general of Catalonia, declared himself dictator—not as an affront to the king, but in revolt at the general mismanagement of politics, and “for the good of Spain,” that it might be freed “from the professional politicians.” The king acquiesced in this *coup d'état*, and gave Rivera full control.

The policy of the dictator government, from the very beginning, was to censor all press criticism and suppress any evidence of lack of faith in the new order. Military rule replaced the former civil offices held by corrupt politicians, whom Rivera believed to be at the bottom of all Spain's troubles; municipal government officials, in particular, were replaced, either by locally elected candidates or by military favorites. In 1925 the military directorate gave place to civil government, at the head of which Rivera continued his rôle as dictator, and as leader of his newly formed Patriotic Union party. The renewed hostilities in Morocco, in 1924-1925, were ably handled by Rivera, though it was not without the timely help of the French that the Riffian tribesmen finally surrendered, in 1926 (see MOROCCO; RIFF, THE). Early in 1930, Rivera's opponents accomplished his downfall; one of his principal enemies became Premier. A.P.

Related Subjects. The reader who is interested in Spain will find much information in the following articles in these volumes:

HISTORY

Alfonso XIII	Iberia
Alhambra	Inquisition
Alva, Duke of	Isabella of Castile
Armada	Moors
Castile and Aragon	Morocco
Charles (V, Holy Roman Empire)	Navarre
Ferdinand V	Primo de Rivera,
Gonsalvo de Cordova	Miguel
Granada	Riff, The
Hamílcar Barca	Spanish-American War
Hannibal	Succession Wars
	Torquemada, Tomas

LEADING PRODUCTS

Copper	Lead
Cork	Mercury
Fig	Sheep
Grape	Wine

SPALATO, *spah lah' toh*. See YUGOSLAVIA (Transportation and Commerce).

SPANIEL, *span' yel*, a name applied to a group of dogs of high intelligence, consisting of

field and water hunting dogs and several smaller breeds of the fancy or “toy” variety. Among the field hunters are the *Clumber*, *Sussex*, *Norfolk*, and *Cocker*; the best-known water spaniels are the Irish breeds. The lap spaniels include



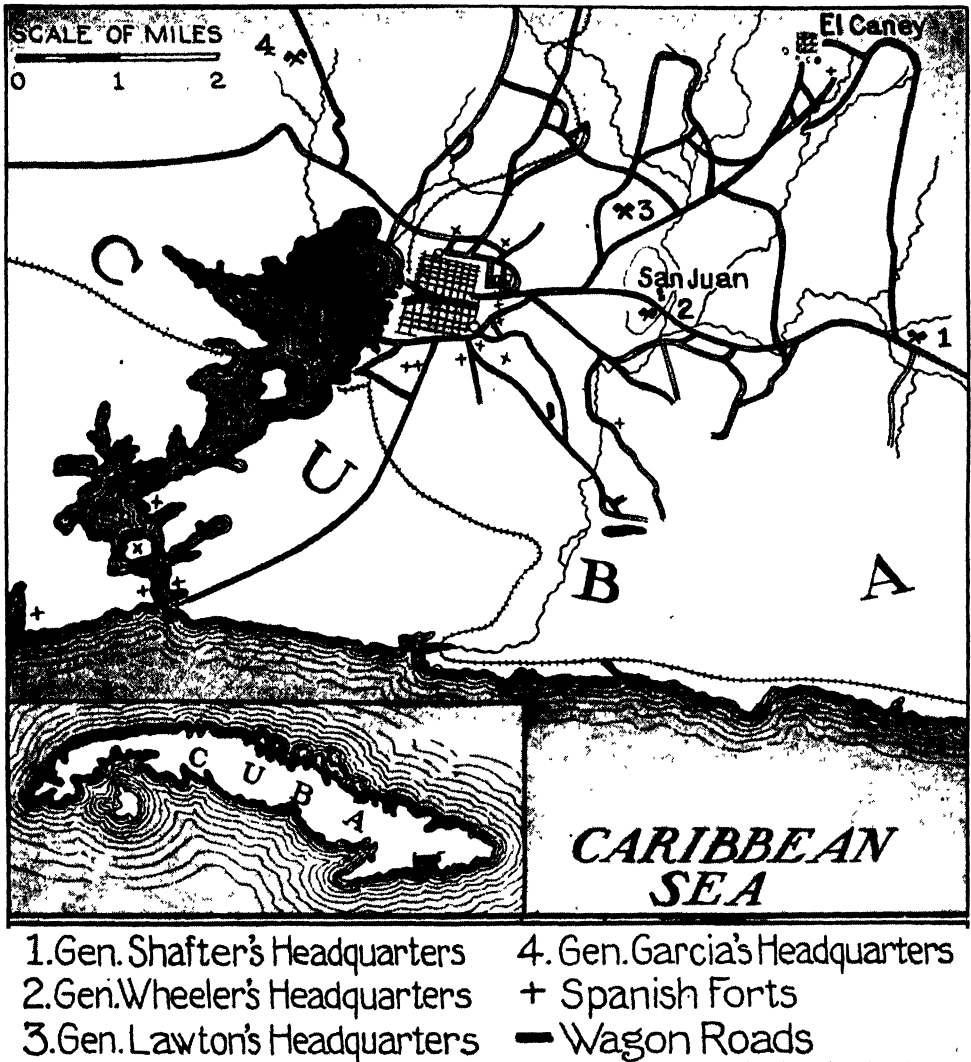
Photo: Visual Education Service

A WATER SPANIEL

the *King Charles*, the *Blenheim*, and the *Japanese*. All varieties have long bodies, drooping ears, and a thick, silky coat. They show a variety of colors, including liver and white, red and white, and black and white. The spaniels are prized because of their intelligence, beauty, and gentle disposition. See DOG. M.J.H.

SPANISH-AMERICAN WAR, a brief war in 1898 between Spain and the United States, but important in its effects upon the world. The contest grew out of the severity and injustice of Spanish colonial administration in Cuba. The policy of successive captains general, entrusted with the government of the island, had for half a century alternated between ineffectual efforts at conciliation and the utmost severity. Taxes were heavy, and the island became involved in serious financial difficulties. The demand for radical reforms and a measure of self-government became more and more insistent. Revolt succeeded revolt; despotism on the one hand was matched by anarchy on the other, culminating in 1895 in an insurrection of formidable proportions.

Extreme measures were adopted by General Weyler, the Spanish governor, against Maximo Gomez and other Cuban chiefs, who were penned in narrow parts of the island by lines of intrenchments, barbed-wire entanglements, and forts, called *trochas*. Women and children, and non-combatants generally, were treated with great cruelty, being herded into camps and surrounded by armed guards. They were insufficiently supplied with food, and were kept alive largely by assistance from the wretched people among whom they lived, and by supplies sent from the United States. Reports of atrocities committed by Spanish soldiers had been frequent, and had inflamed the feelings of peo-



SCENE OF THE PRINCIPAL CAMPAIGN

The small corner insert shows, in its black area, the part of Cuba pictured in the large map.

ple in the United States, already exasperated by years of misrule and anarchy almost at their doors.

President McKinley had steadily opposed recognition of the rebellion; at the same time, he had affirmed the possibility of intervention, and the American attitude was naturally resented by Spain. On the night of February 15, 1898, the American battleship *Maine* was blown up in Havana harbor. Responsibility for the disaster will doubtless never be fixed, but American public sentiment accused Spanish agents, and war became inevitable. Congress formally demanded the withdrawal of Spain from Cuba, but before the message could be

delivered, the American ambassador at Madrid was dismissed, and the Spanish government declared war, on April 24.

Chief Events. On April 22 Commodore Sampson, with the North Atlantic naval squadron, began a blockade of Havana and the north coast; while Commodore Dewey was ordered from his station at Hong Kong to the Philippines, a Spanish possession. Dewey's Asiatic squadron fought the first important engagement of the war at Manila Bay, on May 1, destroyed the Spanish fleet, seized Cavite, and awaited the arrival of land forces to reduce Manila, which was finally accomplished on August 13 (see page 6741).

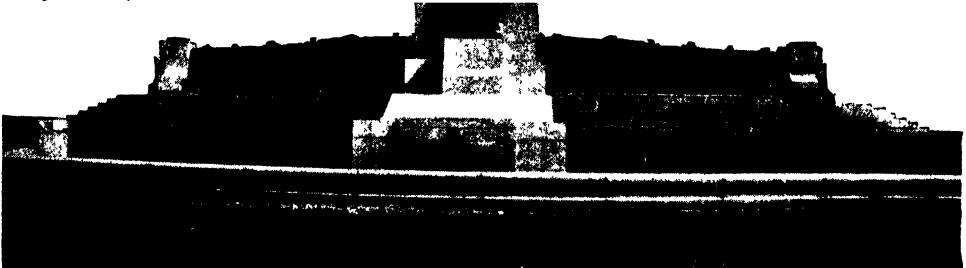
Meanwhile, a Spanish squadron under Admiral Cervera had reached Santiago from the Cape Verde Islands and anchored under the protection of the forts in Santiago harbor. The American forces attempted to close the channel by sinking the collier *Merrimac*, the feat of Captain Hobson, but in this they were not completely successful. Acting on orders from Madrid, Cervera attempted to run the blockade, steaming out under forced draft on July 3. The gunfire of the Americans proved to be vastly superior to that of the enemy, and after a brief but hot running fight, the entire Spanish squadron was sunk or beached. Commodore Schley, in Sampson's absence, directed the battle. Cervera himself was wounded. A land force under Major General Shafter had reached the island on June 20, and after defeating the

most of which was due to disease, was about 2,500.

Minor Incidents. Captain Clark's ship, the battle cruiser *Oregon*, was ordered to join the Atlantic squadron after the Battle of Manila Bay. It made the 12,000-mile voyage around Cape Horn from Puget Sound in a remarkably short time, and reached Cuban waters in perfect condition.

The war fixed public attention upon Commodores Schley and Sampson, who became rivals, or were made so, by their respective champions. Both were advanced to the grade of rear admiral.

Theodore Roosevelt, second in command of the "Rough Riders," had been Assistant Secretary of the Navy and a reform politician in New York state. The war focused the nation's attention upon him, and his election as governor of



MAINE MEMORIAL

Unveiled in March, 1925, by the government of Cuba in memory of the 266 Americans who died when the battleship *Maine* was sunk in the harbor of Havana on the night of February 15, 1898. It occupies a dominant spot overlooking the harbor.

Spanish at San Juan and El Caney, had invested Santiago. In this campaign, the "Rough Riders," under Wood and Roosevelt, distinguished themselves. On July 4 the city was called upon to surrender, but it continued to offer resistance until July 17. With its fall, Spain sued for peace; a protocol was agreed to on August 12, and peace was declared on December 10, when the Treaty of Paris was signed.

The Peace Treaty. By the Treaty of Paris, Spain evacuated Cuba and relinquished Porto Rico, the Philippines, and Guam to the United States, in return for a generous indemnity of \$20,000,000. It was expressly understood that the American interest in Cuba was to be a simple trusteeship, and that a republic, guaranteed by American arms, was to be established on the island. The cost of the war to the United States cannot be estimated entirely from the actual expenditures during the four months of fighting, for the additional territory and international prestige which victory brought to the United States entailed a larger permanent budget for military and naval purposes. The loss of life for the American forces,

New York followed the same year. From that post he was chosen Vice-President of the United States, and became President upon the death of McKinley. Colonel Wood of the "Rough Riders" remained in the service, and by merit rose to the command of the American army.

The Battles in Detail. The following engagements are worthy of note:

El Caney, *el kah na'*, fought four miles northeast of Santiago de Cuba, July 1, 1898, between 4,500 United States troops commanded by General Lawton, and Spaniards led by General Vara del Rey. The Spanish troops were well intrenched, and although numbering only 520, offered stubborn resistance. The Americans won the day, the casualties on each side numbering more than 300.

Manila Bay, a naval battle, the first important engagement of the war. It was fought in the Bay of Manila, in the Philippine Islands, May 1, 1898, between an American fleet under Commodore (later Admiral) George Dewey, and a Spanish fleet of about equal strength under Admiral Montojo, the latter supported by land batteries. The American fleet, which at the declaration of war was in Chinese waters, had proceeded to the Philippine Islands. Dewey attacked the Spanish fleet, and in a battle lasting several hours, ten Spanish ships were sunk or

destroyed, and about 400 Spanish sailors were killed or wounded. The Americans did not lose a ship or a man, and only six were wounded. Dewey was soon reinforced by land troops under General Merritt, and on August 13 the city of Manila was taken. Thus the Philippine Islands, which had been held by the Spanish since the days of Magellan, came into the possession of the United States.

Santiago, a naval battle fought off Santiago de Cuba, on July 3, 1898. The United States fleet, commanded by Sampson and Schley, was unable to enter the harbor on account of strong fortifications, and stood guard before the entrance to prevent the escape of the Spanish fleet under Admiral Cervera. On July 3 that fleet attempted to make a dash from the harbor, but was pursued by the American squadron; after a running fight, six Spanish boats were destroyed or forced ashore. Admiral Cervera and over 1,700 officers and men were taken prisoners. The loss of life on the Spanish vessels was large, but among the men of the American fleet, only one was killed and only ten were wounded.

Related Subjects. Much supplementary information may be found in the following articles:

Cuba	Roosevelt, Theodore
Dewey, George	Rough Riders
Hobson, Richmond P.	Sampson, William T.
McKinley, William	Schley, Winfield Scott
Paris, Treaties of	Spain (History)
Philippine Islands	United States (History)
Porto Rico	Wood, Leonard

SPANISH ARMADA, BATTLE OF THE. See ARMADA; FIFTEEN DECISIVE BATTLES.

SPANISH MAIN. See CARIBBEAN SEA.

SPANISH MOSS. See AIR PLANTS.

SPANISH SUCCESSION, WAR OF THE. See SUCCESSION WARS.

SPANISH TOWN, a seaport in Jamaica (which see).

SPARK COIL. See RADIO COMMUNICATION.

SPARKS, JARED (1789-1866), an American clergyman, historian, educator, and biographer, distinguished as the pioneer in the collection of original documents relating to American history, and as one of the earliest American biographers. He was born at Willington, Conn., and became a minister of the Unitarian Church. He resigned from the ministry in 1823, and from 1824 to 1831 was editor of the *North American Review*. From 1839 until 1849, he was professor of history at Harvard University, his *alma mater*, and from 1849 to 1853 served as president. His greatest activity, however, was in the fields of biography and history.

One of the best-known works of Sparks is his edition of the *Writings of George Washington*, in twelve volumes, the first volume of which is a biography of Washington. He also edited *The Library of American Biography*, the writings of Franklin, and various collections of documents and letters. His great collection of manuscripts he bequeathed to Harvard University, and his private library was purchased by Cornell University.

SPARROW, the name applied to several species of plain-appearing song birds, with

cone-shaped bills adapted to the shelling and eating of seeds. They are found in all parts of the world except the Australian region. Most species are migratory; those nesting in the Northern United States and Canada winter in the Gulf states. Among the best-loved of American species are the *song sparrow*, with its clear, high trill; the *vesper sparrow*, with its sweet, plaintive note; and the beautiful *white-*

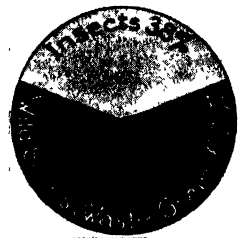


WING OF A SPARROW

- | | |
|-----------------------------|---------------------|
| (a) Scapulars | (e) Greater coverts |
| (b) Lesser coverts | (f) Primary coverts |
| (c) Middle coverts | (g) Tertiaries |
| (d) Ala Spuria (false wing) | (h) Secondaries |
| | (i) Primaries |

throated and *white-crowned* sparrows. The largest of the group are the *fox sparrow* and the *Harris sparrow* of the Western prairies, the latter a species having much black splashed about its head and breast. Both fox and Harris sparrows gather in flocks on spring mornings and evenings, and sing enchantingly in chorus. The *tree sparrow*, or *winter chippy*, and the *chipping sparrow* are marked with chestnut crowns. The *field sparrow* frequents dry pastures and hillsides.

The *English*, or *house sparrow*, a nondescript bird found about houses and villages in most parts of the Old World, was introduced into the United States in the middle of the last century, and has spread with incredible rapidity to all parts of the country, driving out the native sparrows, wrens, martins, bluebirds, and even mocking birds, and replacing their songs with its continual strident chirpings. It rears three or four broods in a season, building in any available place of any available material, proving a pest about buildings, especially in eave troughs and drains. The eggs are five to seven in number, generally white in color, finely marked with olive.



FOOD OF THE CHIPPING SPARROW



Photos: Visual Education Service

Some of the Sparrows. (1) Swamp sparrow. (2) Fox sparrow. (3) Lincoln's sparrow. (4) White-crowned sparrow. (5) Song sparrow. (6) Chipping sparrow.

Though some contend that the English sparrow is valuable in the destruction of the seeds of noxious plants, the general agreement is that we should be better off if we could exterminate the noisy little alien and invite back our former bird neighbors. This is the only sparrow not regarded as beneficial.

D.L.

Scientific Names. Sparrows belong to the family *Fringillidae*. The English sparrow is *Passer domesticus*; the song sparrow is *Melospiza melodia*; the western vesper, *Poocetes gramineus confinis*; the white-throated, *Zonotrichia albicollis*; the white-crowned, *Z. leucophrys*; the fox, *Passerella iliaca*; the Harris, *Zonotrichia querula*. The tree is *Spizella monticola*; the chipping, *S. passerina*; and the field, *S. pusilla*.

SPARROW HAWK, the smallest North American member of the group of true falcons. It breeds from Northern Canada to Northern Mexico, and winters in the Southern United States and south to Guatemala. The back and shoulders of the male are marked with reddish-brown and black, and its wings are a grayish-blue. The sparrow hawk is commonly seen perched on dead trees, telegraph poles, and other elevations, watching for its food, which consists of insects, small rodents, reptiles, and sometimes smaller birds. It nests in holes in trees, and occasionally on buildings in towns. It is about the size of a mourning dove, but has a longer tail. It is easily identified by its call note, "killy, killy, killy, killy." The eggs are five to seven in number, creamy white to reddish in color, marked with brown. Because of the good service it renders in destroying harmful insects and rodents, the little sparrow hawk should be encouraged and protected. See **FALCON**.

D.L.

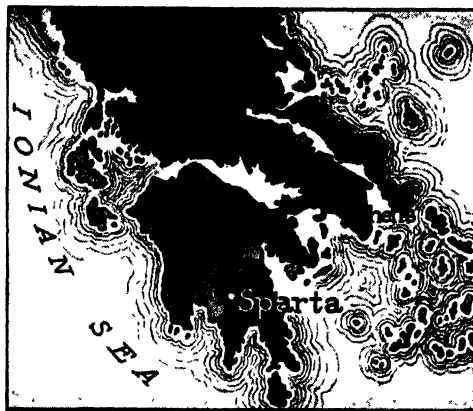
Scientific Name. The sparrow hawk belongs to the family *Falconidae*. Its scientific name is *Falco sparverius*.

SPARTA, famed in Grecian history as the land of warriors and the abode of war, was the capital of Laconia, and at one time the most powerful city state in ancient Greece. It was picturesquely located in the northern part of the central plain of Laconia, about thirty miles from the Mediterranean Sea and on the right bank of the Eurotas River. Laconia was the southernmost division of that part of Greece known as the Peloponnesus. Sparta was in reality a community of five different villages having a common market place. The settlement lacked a rock citadel, such as its rival, the city of Athens, possessed in the Acropolis, but Sparta was so safeguarded from invasion by mountain barriers that it developed into a powerful state on the level plain, without even a wall about it.

Early History. According to tradition, the city was founded by Lacedaemon, a son of Zeus by the mortal Taygete. The legend has it that Lacedaemon married Sparta, a daughter

of Eurotas, and named the city for his wife. While many details of the authentic history of the settlement are unknown to us, it is generally accepted that the city was taken over by the Dorians, about 1000 B.C., when they invaded the Peloponnesus. These Dorians were the ancestors of the Spartans.

In the latter part of the ninth century, a great lawgiver appeared—Lycurgus—who framed a new constitution or perhaps revised one already existing. The adoption of this constitution laid



LOCATION MAP

the foundations for the prosperity and growth of the Spartan state. It provided for two kings who ruled jointly, a senate of elders, twenty-eight in number, a governing board of five ephors, and a general assembly composed of all Spartan citizens over thirty years of age. Rigid military training was imposed, a system that produced men of iron nerve and women who said to their sons, as they departed to battle, "Come home with your shield or upon it." This stern training deserves special description.

Training the Spartan Boy. Every Spartan belonged to the state from the time of his birth, according to the laws of Lycurgus. When a boy was born, his father was obliged to bring him before the elders to be examined. They decided whether the child should be reared or left to die. If it was robust and well proportioned, they issued orders for its education, and assigned to it a certain share of land, as the Spartans were forbidden by law to engage in manufacture or trade. If, however, the child was weakly or deformed, its life was considered worthless, and it was cast into a deep cavern in the mountains and left to perish.

A boy was left to the care of his parents until seven years of age, when he was enrolled in a company consisting of fifteen members, all of whom were kept under the strictest discipline. From the age of seven, every Spartan was compelled to take all his meals with his particular company, in a public dining hall.

The bravest boy in a company was made captain, and the others obeyed his commands and bore such punishments as he meted out to them.

When the boys were twelve, their undergarments were taken away, and only one outer garment a year was allowed them. Their beds consisted of the tops of reeds, which were gathered with their own hands without knives. The arts of reading and writing were not considered essential, but leaping, running, wrestling, and wielding a weapon with grace and accuracy were accomplishments which must be cultivated. At about the age of thirty, the Spartan attained full maturity and enjoyed the rights and duties of citizenship. The sixtieth year closed the military career, and thereafter a citizen was employed either in public affairs or in the training of the young, according to the prescribed rules.

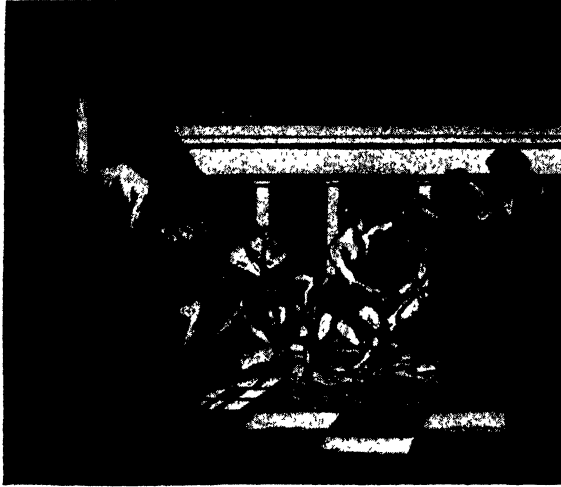
As a result of this system, the Spartans became distinguished for the wonderful perseverance and patience with which they endured every conceivable hardship and suffering. From childhood, life was one continued trial of patience; on certain religious occasions, a boy would voluntarily ascend the altar and submit himself to the most cruel lashings. These sometimes lasted a whole day, and from them victims would frequently expire without a groan.

Rise to Supremacy. After the organization of the state under Lycurgus, Sparta gradually conquered all of Laconia. The territory known as Helos was utterly subjugated, and its people were made state slaves. [The word *helot* is derived from this circumstance.] Another class also developed—the Perioeci (“Dwellers Around”). These were conquered people who were allowed to retain their lands and till them, but were compelled to pay tribute to the Spartans. In time of war, they were forced to fight for their overlords. It is noteworthy that the Spartans, though absolute masters of Laconia, represented only a small proportion of the total population. Other conquests followed. Messenia, the most fertile district in the Peloponnesus, was subjugated between 743 and 630 B.C., and the Messenians

were made serfs. By the middle of the sixth century, the supremacy of Sparta was recognized throughout the Peloponnesus, and the city states in the north had begun to herald it as the leader of all Greece.

The Decline. Meantime, a state beyond the Peloponnesus was rising to power—Athens—a state in which art, literature, and philosophy were supreme. The Athenians joined with the

Spartans in repelling the invading Persians, and Athens emerged from the struggle with enhanced prestige, eventually becoming the dominating power in Greece [see GREECE (The Persian Wars)]. Athens, however, was conquered by its rival in the hard-fought Peloponnesian War, and in 404 B.C. was forced to accept a humiliating peace treaty. But the leadership claimed by Sparta was short-lived. So cruelly did the



THE TRAINING OF SPARTAN YOUTHS
[From an old painting.]

Spartans rule over the other Greek states that they revolted and threw off the yoke. At the Battle of Leuctra, in 371 B.C., Sparta lost forever its claim to supremacy in Greece, and in 146 B.C. it passed with the rest of the country under the rule of Rome.

There is a modern town of Sparta near the site of the ancient city. It was laid out in 1834 and made the capital of the modern political division of Laconia. Excavations have been made on the old site, but no such interesting ruins as may be seen in Athens have been found.

B.M.W.

Modern Interpretation. The spirit of perseverance and endurance which the people of Sparta personified is referred to as *Spartan*; hence the adjective is used to-day to describe one who is undaunted, courageous, and persevering, even under adversity.

Related Subjects. The reader is referred in these volumes to the following articles:

Athens	Helots
Dorians	Lycurgus
Greece	Peloponnesian War
(History of Greece)	Peloponnesus

SPARTACUS, a Roman gladiator, the most famous of all time, although his glory was not achieved in the arena. He was the leader of a formidable slave rising, which nearly succeeded. Spartacus was born in Thrace, but was made prisoner by the Romans, sold as a slave, and

taken for training to a gladiatorial school in Capua. With seventy comrades he escaped from the school, and despite attempts of the soldiery to restrain him, established himself on Mount Vesuvius. Slaves seeking freedom flocked to him by thousands, and he was able to overcome in battle several Roman forces.

Leaving his mountain fastness when he felt that his army was large enough, Spartacus succeeded in gaining possession of almost all of Southern Italy. Two consuls were sent against him, but he defeated them both and led his followers toward the Alps, meaning to lead them out of Italy, that they might be free and return to their homes. The slaves themselves, however, were determined to march on Rome, and compelled Spartacus to lead them, but they lacked courage when the critical moment arrived. A fresh army under Marcus Licinius Crassus was sent against Spartacus; at first he defeated it as he had done before, but dissension broke out among his followers, and in 71 B.C. a pitched battle resulted in the annihilation of his army. He himself, having stabbed his horse, fought on foot, and showed incredible valor before he met his death. The rising subsided with the death of the leader. See GLADIATORS.

SPARTANBURG, S. C. See SOUTH CAROLINA (back of map).

SPARTAN TRAINING. See SPARTA (Training the Spartan Boy).

SPASM, *spaz'm*, a more or less violent jerking and contortion of the muscles, is a symptom of several disorders. It is the most prominent symptom of epilepsy (which see), and is a common affliction of children suffering from intestinal trouble. It also occurs in many cases of poisoning, and is a late symptom of Bright's disease. The spasms, or "fits," that attack small children and babies should be treated as follows, according to the advice of a specialist:

Keep the child perfectly quiet with ice at the head, put the feet in a mustard bath, and roll the entire body in large towels which have been dipped in mustard water (two heaping tablespoonfuls of mustard to one quart of tepid water), and have plenty of hot water and a bathtub at hand, so that the doctor can give a hot bath if he thinks it advisable.

If the convulsions have continued until the pulse is weak, the face very pale, the nails and lips blue, and the feet and hands cold, the hot bath will be useful by bringing blood to the surface and relieving the heart, lungs, and brain.

The temperature should not be over 106° F.; this should always be tested by a thermometer if one can be obtained. Without this precaution, in the excitement of the moment, infants have frequently been put into baths so hot that serious and even fatal burns have been produced. If no thermometer is available, the nurse may plunge her arm to the elbow into the water. It should feel warm, but not so hot as to be at all uncomfortable. One-half a teacupful of powdered mustard added to the bath often adds to its efficacy.

W.A.E.

SPATHE. See ARUM.

SPAVIN, *spav' in*, a disease of horses affecting the hock, or joint between the knee and the fetlock. It occurs in two forms, *bone spavin* and *bog spavin*. Bone spavin consists of a bony enlargement on the inside of the hock, at the head of the shank bones or between the small bones of the shank. At first the spavin grows very slowly, and it may not be noticed until the horse becomes lame. No remedy has been found which will cure bone spavin, but blistering the part and allowing the animal several months' rest may afford some relief. The disease is dreaded by horsemen, since it may render an otherwise perfectly sound animal nearly worthless.

Bog spavin is a soft swelling around the joint caused by the accumulation of synovial fluid (joint oil), and is usually caused by straining the joint. It is more likely to occur in young than in old horses. The treatment consists in hot applications, blistering, and, as a last resort, "firing" with a hot iron, which should be done by a skillful veterinary surgeon.

SPAWN, the eggs of fishes, mollusks, frogs, and reptiles, especially when found in masses. Usually, they are produced in great numbers, particularly among sea animals which are preyed on by larger species, or which leave eggs and young to hatch and develop alone. The production of countless millions of eggs by water-inhabiting animals is necessary to keep the different species from extinction. It is an interesting fact that fresh-water fish often deposit their eggs in the sea, while sea fish often ascend fresh-water streams during the spawning season. The collected masses of eggs of certain fish are often used in making the delicacy known as *caviar*.

W.N.H.

Related Subjects. The reader is referred in these volumes to the following articles:

Caviar	Frog
Fish (Reproduction)	Salmon

SPEAKER, the title of the presiding officer in the lower house of various national, state, and provincial legislatures. The Speaker is the central figure in the United States House of Representatives, and his position is deemed by many to be second in importance only to that of President of the United States. In Canada the Speaker presides over the Dominion House of Commons at Ottawa; the presiding officer of the provincial assemblies is also given the title. The term had its origin in a custom of past centuries in Europe, when legislative bodies were addressed by the head of the government, and the presiding officer was expected to respond.

The duties of the Speaker are defined by the rules of the body which chooses him, and the dignity and character of the proceedings of the assembly are determined very largely by

the ability, fairness, and resoluteness of the Speaker. In most instances, he has immense political power, which he sometimes uses in the interests of his party.

In the United States. The Speaker is elected by his fellow members of the House of Representatives to serve during their term of office, which is two years—the length of life of one Congress—and he retains every privilege of voting and speaking, in common with every other member. When he wishes to speak upon any measure, he calls another member to the chair and takes his place upon the floor of the House. The Speaker is supposed to open and close all sessions of the House, although he may delegate the duty at any time to another member; he is responsible for maintaining order; he rules on all questions of parliamentary law and procedure; and signs all official documents of the House.

The salary of the Speaker is \$15,000 a year, \$5,000 more than his fellow members of Congress receive, and the same as that of the Vice-President. His powers may be limited in any session of the House, for he is controlled by the rules the majority adopts, but with thousands of bills to be presented in rapid succession, and an unwieldy assembly of 435 members, the presiding officer must be able to exercise a great deal of power, or little would be accomplished. From 1790 to 1910, the Speaker had the right to appoint all committees of the House, and to select their chairmen. As these committees practically control legislation, this appointive power gave the Speaker a vast amount of influence. In March, 1910, after two days of contest, closing one of the fiercest parliamentary battles in the history of Congress, the right to appoint committees was taken away from the Speaker and given to the members of the House, who thereafter determined to make committee appointments in party caucus.

The Speaker is chairman of the committee which formulates the rules of the House and can therefore practically dictate procedure. He is the head of his political party in the House, and, unlike the rule in England, seldom drops his partisanship, even in official rulings. His partisans are in a majority, because he is chosen by the party which is in the majority, and are therefore responsible for whatever the House accomplishes; they are also charged with whatever failures there may be in carrying out a legislative program. The Speaker, to some extent, controls both situations.

The speaker of the house in the state legislatures is an official of like power, but, naturally, within narrower limitations. His control of legislative situations determines to a considerable degree the progress and character of law-making for the state. His position in the state legislature corresponds with that of the Speaker

of the United States House of Representatives before the latter was shorn of his power to appoint the committees. In the states, the speaker yet makes all committee appointments.

In Great Britain. In the British Parliament, the Lord Chancellor is presiding officer of the House of Lords. The Speaker of the House of Commons is always a member of that body, and is elected by the members, subject to the approval of the sovereign. There is a great difference between the power of the Speaker of the House of Representatives in the United States and that of the Speaker of the House of Commons in Great Britain. When the British Speaker takes the chair, he is expected to divest himself of all party ties and sympathies. When he dons the traditional wig and gown of his office, he must lay aside all political preference, may express no political opinions, and must administer the same kind of impartial treatment to all members of the House. His position is one of great dignity, but it carries no political power.

He seldom speaks in his capacity as a member of the body, and votes only in case of a tie. The symbol of his authority is the mace, which is carried before him by the sergeant-at-arms whenever he enters or leaves the House. It accompanies him on all state occasions, and lies on the House table when he is in the chair. Both law and custom give the Speaker social precedence over all the commoners in the kingdom, except the Prime Minister, and it is usual for the Crown to make a retiring Speaker a peer, generally with the rank of viscount. His salary is £5,000 (\$25,000) a year. Usually, the same Speaker is reelected to many successive Parliaments.

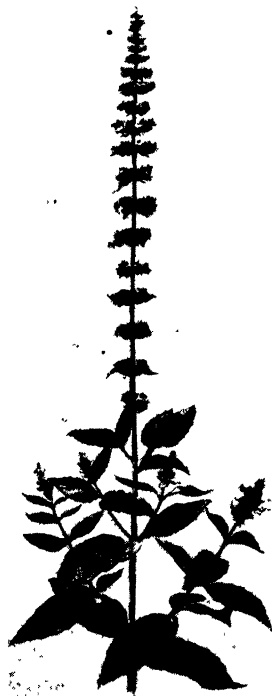
In Canada. See CANADA (The Dominion Government).

Related Subjects. The reader is referred in these volumes to the following articles:

Congress
Mace
Representatives,
House of

SPEARFISH CANYON. See SOUTH DAKOTA (The Land).

SPEARMINT, a species of mint found in temperate regions in most parts of the world, which yields an oil used in the preparation of perfumes, medicine, chewing gum, candies, julep, soup, and sauce. The world's most important center of spearmint-distilling is Saint



SPEARMINT
In blossom.

Joseph County, Mich. This county also produces ninety per cent of the peppermint of the United States. The spearmint plant has smooth, erect stems that grow one or two feet in height and, at the top, bear whorls of pale-purple or white flowers. This species of mint furnishes the flavoring for mint julep and for the sauce which flavors lamb or mutton. See MINT.

B.M.D.

Scientific Name. Spearmint belongs to the family *Menthaceae* (or *Labiatae*). Its botanical name is *Mentha spicata*.

SPECIAL DELIVERY. See POSTOFFICE DEPARTMENT, subhead.

SPECIAL SENSES. See SENSES, SPECIAL.

SPECIAL SESSION. See CONGRESS OF THE UNITED STATES.

SPECIE, *spe' shih*, PAYMENTS, RESUMPTION OF. This is a term which indicates the beginning of circulation of specie (metal coins), or "hard money," as it is sometimes called, after a time of suspension of its use, during which time only paper money was circulated. Such suspension has occurred a number of times in the United States.

During the War of 1812, the United States government found it necessary to borrow more money than the state banks of the country could raise. This made it very hard for the people everywhere to obtain money, and it also kept money out of the banks, because people were afraid that, if they did deposit their money, they could not draw it out again. The situation was so serious that the government authorized the banks of the country to suspend the payment of specie, or coin, and to give out only paper money, called then *credit money*, which in times of stress was of uncertain value. The resumption of specie payments is usually very gradual, and it requires some time for the country to recover from the financial strain of such a crisis. In the instance referred to above, resumption did not begin until 1817, and it was several years before conditions were normal. Other similar experiences occurred in 1837-1838, 1846, 1857-1858, and a later one of most far-reaching effects followed the War of Secession.

The Last Resumption. During the War of Secession, the banks of the country were obliged to suspend specie payment, and the people thereupon began to hoard their gold and silver, instead of entrusting it to the banks. As a consequence, the government issued a large volume of United States Treasury notes, generally called *greenbacks*, and compelled their circulation as money by making the people accept them in all business transactions. This gave temporary relief, and two similar issues were afterward made, so that, by the end of the war, there were over four hundred million dollars of such money in the United States.

What to do with this mass of paper money was a perplexing problem. The first fifty millions were gradually retired through the sale of government bonds. In 1869, however, Congress solemnly declared it to be the purpose of the United States to pay the greenbacks in "coin or its equivalent." Accordingly, in 1875 a bill was enacted making arrangements to "resume specie payment" January 1, 1879. The Secretary of the Treasury was authorized to sell bonds and accumulate a store of gold for the purpose of redeeming, on demand, the greenbacks. But in 1878 Congress enacted that the volume of greenbacks then in circulation—\$346,681,016—should not be retired when presented for payment, but should be reissued and paid out again and kept in circulation.

The Treasurer accumulated a large fund of gold, and then it was discovered that the great mass of the people had no desire to exchange greenbacks for gold. They were as good as gold simply because the government was ready to exchange gold for them. In the next twelve years, only about \$28,000,000 were presented for redemption. January 1, 1879, marks the resumption of specie payments by the United States; since that time, all government issues of whatever nature have been on a parity with gold.

Related Subjects. The reader is particularly referred to the article MONEY (Monetary System of the United States: Paper Money). See, also, HAVES, RUTHERFORD BIRCHARD.

SPECIES, *spe' sheez*, in the classification of plants and animals, a group of individuals which reproduce their kind. All members of one species are alike in various essential particulars, and show a resemblance to a common ancestor. Several species are included in a genus, and a species may in turn be divided into varieties or subspecies. See CLASSIFICATION, for fuller explanation.

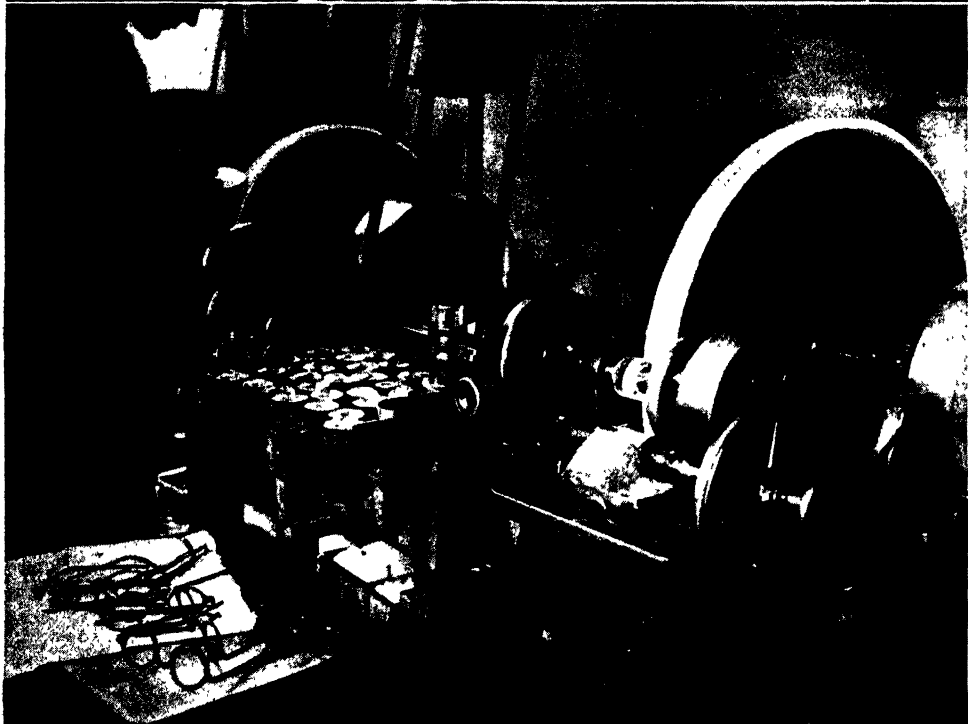
R.H.

SPECIFIC, *spe sif' ik*, GRAVITY. See GRAVITY, SPECIFIC.

SPECTACLED SNAKE. See COBRA.

SPECTACLES, the name given to an instrument or device for aiding and correcting defective sight, consisting of a pair of lenses, mounted in a frame to hold them in position before the eyes. The first device of this kind is said to have been invented by Roger Bacon, in the thirteenth century, but Italian antiquarians credit a Florentine monk with this achievement (1285). Regardless of its inventor, the first device of this kind was crude and clumsy, and was not greatly improved until the eighteenth century, when the grinding of lenses was first based upon the principles of the refraction of light (see LENS; EYE).

The lenses are made of clear or rock-crystal glass, and are ground to suit the defect of the eye. In cases of nearsightedness, a concave glass is used; by this means, the rays of light



Photos: U & U

How Spectacles Are Made. Above, the operator is shown using a diamond saw to cut up blocks of crude glass. Below, a detail of the process of grinding the edge of the lenses before fitting into frames. The intermediate process involves grinding each lens to meet the requirement of the prescription of the physician or optometrist. See OPTOMETRY.

SPECTRUM ANALYSIS



are diverged and a clear image is formed on the retina. For farsightedness, the convex lens is used, converging the light rays. The thicker the lens, the greater is its magnifying power. Astigmatism, which is a structural defect of the eye, is remedied by cylindrical lenses which bring the rays of light to a common focus on the retina. The lenses are adjusted so as to make the distance of distinct vision about twelve inches from the eye.

When different lenses are needed for examining distant objects and those near the eye, *divided spectacles*, or *bifocals*, are used. These were invented by Benjamin Franklin. In bifocal glasses, each section consists of two semicircles of different focal power; the lower and smaller section is used for reading and close observation, and the upper section for looking at distant objects. When correctly fitted, spectacles can remedy most defects of vision, but if not exactly suited to the eye, they are injurious rather than beneficial. Therefore they should be fitted by a skilled optometrist and changed when the eye changes. Colored glass is used in spectacles to protect the eyes from the glare of the sun.

The frame is made of tortoise shell or metal, usually gold, silver, or steel. It consists of a bridge, rims, sides, and bows which fit over the ears. Lenses supported on the nose by means of a spring and having no sides and bows are called *eyeglasses*.

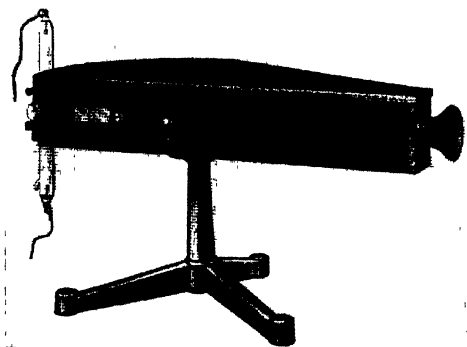
SPECTROGRAPH, *spek' tro graf*. See ASTRONOMY (How Astronomers Work).

SPECTROSCOPE, *spek' tro skohp*, an instrument for studying the spectra of bodies to determine their composition (for a full explanation of the term *spectrum*, see LIGHT). Briefly, the spectrum of a body is the image formed when its light rays are dispersed after passing through a prism. The simplest form of spectroscope is a triangular glass prism, and the method of using it is shown in the diagram accompanying the article LIGHT. In a spectroscope of this sort, the colors overlap. For the purpose of analysis, it is necessary that each color be sharply defined, and this definition is secured by the use of a telescope and other tubes in connection with the prism.

The spectroscope in general use is shown in the accompanying illustration.

The compound spectroscope used in obtaining spectra of the heavenly bodies consists of a series of prisms arranged in the arc of a circle, so that the spectrum is magnified by each before it is viewed by the observer. These spectroscopes are so constructed that they can be attached to the eyepiece of a large telescope. Astronomers measure distances and velocities of stars by means of the spectroscope. The dark lines appearing in the spectra of glowing bodies move toward one or the other end of the spectrum, according as the body under in-

vestigation is approaching the observer or receding from him. Upon this principle, astronomers have based some of their most remarkable discoveries. Further information will be found in the article SPECTRUM ANALYSIS.



A SPECTROSCOPE

SPECTRUM. See COLOR; LIGHT (The Spectrum).

SPECTRUM, DIFFRACTION. See DIFFRACTION.

SPECTRUM ANALYSIS. The effect of passing a beam of sunlight through a glass prism in a dark room is shown in the diagram under LIGHT. The image of rainbow colors formed by this experiment is called the *solar spectrum*, because it is produced most perfectly by sunlight, but it has been found that any glowing substance, such as molten iron or burning hydrogen, will produce a spectrum. Moreover, each substance, if in the gaseous state, forms a spectrum different from that of any other substance; therefore, by studying the spectrum of any substance, we can learn its chemical composition. The term *spectrum analysis* is applied to this sort of study.

A spectrum that shows an unbroken array of colors from red to violet is a *continuous spectrum*, like that formed by sunlight. The spectrum formed from a single substance, like hydrogen, for instance, or that from a number of gases, is not continuous, but shows bands or lines of color separated by dark spaces, and it is known as a *bright-line spectrum*. Experiment has shown that, when the light of a glowing substance is passed through the vapor of another substance, this vapor absorbs the colors that appear in the spectrum of the absorbing substance, causing black lines to appear in the spectrum. A spectrum formed in this way is called an *absorption spectrum*. To illustrate, the interior of the sun is a glowing mass, but when viewed through the spectroscope, the solar spectrum contains a number of dark lines which are caused by gases that surround the heated interior of the sun, and absorb the colors that they produce in the spectrum.

Fraunhofer Lines. The different colors of each substance always appear at the same place in the spectra. Consequently, when a dark line appears in place of the color that a given substance, as sodium, would produce, it proves that the light from the substance under observation is passing through the vapor of sodium. These dark lines were discovered by Fraunhofer, a Bavarian optician, and in honor of their discoverer were named *Fraunhofer lines*. The German physicist Kirchhoff concluded that these lines were caused by the presence in the sun's atmosphere of those substances which themselves produce bright lines in the same position on the spectrum. That is, the spectrum revealed the substances of which the sun was composed. Further experiments showed that the earth and many of the stars are composed of the same substances. Concerning the importance of this discovery, the eminent scientist Helmholtz said:

It has excited the admiration and stimulated the fancy of men as hardly any other discovery has done, because it has permitted an insight into worlds that seemed forever veiled to us.

Uses. In addition to its use in astronomy, spectrum analysis is employed in testing minerals for the discovery of new metals, and a number of the rare metallic elements have been discovered in this way. It is also employed in testing the purity of substances, since the minutest quantity of an adulterant can be detected. It is estimated that the spectroscope will detect the presence of as small a quantity as $\frac{1}{100,000}$ of a grain of lithium. This instrument has also aided marvelously in the study of atomic structure. A.L.F.

Related Subjects. The reader is referred in these volumes to the following articles:

Atom	Light (The Spectrum)
Chemistry	Newton, Sir Isaac
Color	Rainbow
Diffraction	Spectroscope

SPECULAR IRON. See HEMATITE.

SPECULUM METAL. See BRONZE.

SPEECH, the production by the vocal organs of articulate sounds for the purpose of communicating ideas. In a sense, it means the same as *language*, but, more accurately considered, the latter is the organized body of articulate sounds, while speech is the art of producing those sounds. Besides man, no animal, so far as is known, is capable of anything which may be correctly termed speech, but certain birds may be trained to imitate very closely the sounds produced by the human voice. Just how many sounds and modifications of sounds are used in the speech of mankind is not known, but scholars estimate them at approximately 1,000. Since the vocal organs differ in their formation or development, sounds easy and natural to one body of people may be practically impossible to another, and

few if any languages contain over fifty distinct sounds.

Related Subjects. The reader is referred in these volumes to the following articles:

Consonant	Orthography
Languages of the World	Vowel

SPEEDOMETER, *speed om' e tur*, a device used on motor vehicles to indicate mileage. Most speedometers have attachments which indicate the total number of miles traveled, miles per hour, and mileage per trip. The device is usually operated through the action of a revolving magnet driven by a road wheel of the vehicle. Though not required by law, speedometers are almost a necessary part of the equipment of a motor vehicle, since all communities now have speed laws which must be obeyed. The device which registers mileage on a bicycle is called a *cyclometer*.

A similar instrument is used by surveyors, and is attached to the wheel of a light vehicle, or to a wheel with a shaft or handle by which it is pushed along, each revolution causing clockwork to be set in motion. The number of revolutions is indicated on a dial, and from this, knowing the circumference of the wheel, it is a simple matter for one to calculate the distance covered. See illustration, page 6751.

SPEEDWELL, companion ship to the *Mayflower*. See PLYMOUTH COLONY (The Mayflower).

SPEISS, *spise*, ADOLPH. See PHYSICAL EDUCATION (Development Through the Centuries).

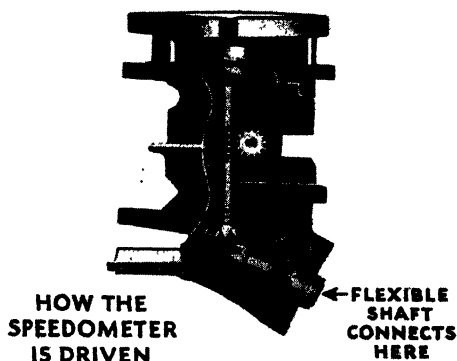
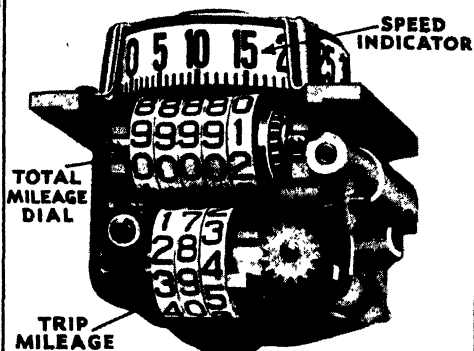
SPEKE, *speek*, JOHN HANNING (1827-1864), discoverer of the source of the Nile River, was born at Jordans, in Somersetshire, England. During service with the Indian army, he made trips into the Himalaya Mountains, and even entered Tibet. In 1854 he went with Sir Richard Burton into Somaliland, and three years later he and Burton set out to explore the lakes in Central Africa, finding Lake Tanganyika. While Burton was ill, in 1858, Speke discovered Victoria Nyanza, which he rightly considered the source of the Nile.

Burton discredited the theory, but in 1860 Speke was put in charge of an expedition for the further exploration of the Nile sources, with the result that the outlet of the lake into the river was found. Meeting Sir Samuel Baker, Speke gave him information which led to the discovery of Albert Nyanza.

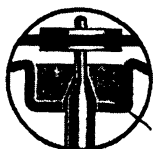
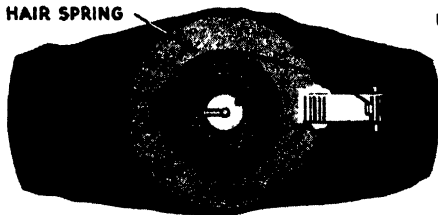
Writings. Speke recorded his experience in *What Led to the Discovery of the Source of the Nile* and *Journal of the Discovery of the Source of the Nile*.

SPELLING. The ability to spell is everywhere taken for granted as one of the fundamental requirements of an education. A man may "have no head" for mathematics; his penmanship may be almost illegible; he may have neglected literature entirely in his love for

IT MEASURES YOUR MILES



HAIR SPRING



UPPER JEWEL

SPEED CUP AND DIAL

UPPER JEWEL
FIELD PLATESPEED CUP
STAFF

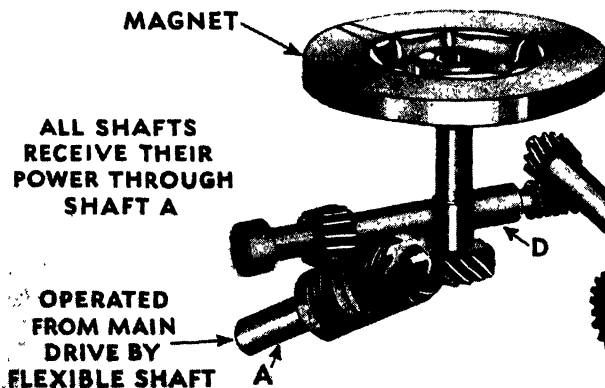
MAGNET SHAFT

LOWER JEWEL

MAGNET
MAGNET SUPPORT

HAIR SPRING

**COMPLETE
MECHANISM OF SPEED DIAL**



**SHAFT C OPERATES
THE TOTAL MILEAGE
DIAL. C GETS ITS
POWER FROM D**

**SHAFT E OPERATES
THE TRIP DIAL.**

science; and yet those with whom he comes in contact may not condemn him as an uneducated person. But if he misspells any of the words in common use in written communication—there are about 1,500 such words—he will be looked upon, by those who know of his failing, as an untrained and illiterate individual. True, such a judgment may be unjust, but it is generally made; and it is this tendency to judge a man's education by his spelling that gives to the subject its importance in school.

This importance has always been recognized, and stress has been laid on the teaching of spelling which is somewhat out of proportion to its real importance in life. But the subject has always presented difficulties to teachers who have wished to make their teaching really vital. It seems to be a mechanical study, requiring practically no skill on the part of the teacher, and furnishing little or no motive to the learner. A pupil formerly studied his spelling lesson doggedly, as a stupid task imposed on him by authority, because it did not appear to touch any of the interests of his life. Even the teacher who was willing to seek far afield for illuminating subject matter—who could make a history or a reading lesson as entertaining as a game—usually found herself baffled by the spelling lesson, when she attempted to make it interesting and appealing to her pupils.

The Change in Method. There has been, however, in recent years, a decided change in the methods of teaching spelling. The old method was comprised in the one word—drill. A list of words, frequently unrelated to one another, was assigned for each lesson; and these words the pupil muttered over to himself until he felt that sheer repetition had engraved them on his memory. The recitation consisted of the writing or spelling aloud of these words; and the teacher sometimes felt that she was imparting a touch of originality when she changed the order of the words, that the pupil might not have the mechanical assistance of an arrangement learned by heart. If pupils could not spell accurately, their parents and even their teachers felt that what was needed was more drill.

Spelling books themselves have changed from lists of words graded according to their supposed difficulty to organized lists of the words most frequently used by children in each grade. Words most often misspelled are given special attention. All of this listing and organization is done on the basis of actual investigations made in schoolrooms, showing the written vocabulary of pupils in each grade, and the difficulty of each word as indicated by the frequency of misspelling.

To-day, also, in the assignment of a spelling lesson, the crucial parts of words are pointed out, modes of study are suggested, and devices

are introduced for interesting the pupils in the derivation, meaning, and proper use of words. Then, too, the spelling is kept, so far as possible, within the range of the pupil's interest; he is asked to spell only such words as he feels the need of knowing how to spell—only the words which are in his vocabulary. When it seems desirable to introduce new words, this is accomplished indirectly; the pupil is given the new experience, is then taught the words which describe it, and so is brought to feel, quite naturally, the necessity for learning how to spell the new words. Teachers may supplement the textbook by class lists and by personal lists for each pupil, in which his particular difficulties and progress are studied.

The old drill method often neglected the meanings of words; the present "thought" method lays as much stress on meaning and pronunciation as on spelling. It is not sufficient that a pupil be able to repeat glibly the definition of a new word; he must be able to use it in a sentence in such a way that it admits of no ambiguity. Each word should be made to call up as many associations in the pupils' minds as possible; in fact, spelling should become a real *word study*, and not a mere letter-by-letter memory of words.

The Spelling Vocabulary. As indicated above, the course in spelling has undergone revision with a view to including only those words that are likely to be used by the individual after he leaves school. Formerly, it was thought that children should be required to learn many words for which they would never have any actual need, because it was believed that, in mastering these words, they would receive good training in memory. This has been shown by psychological experimenters to be a fallacy. One may through training acquire a good memory for words, but at the same time his memory for legal, or geographical, or historical, or psychological, or commercial, or household economic facts and principles may not be improved in the least. There is some reason to conclude that excessive memory work in spelling may weaken, rather than strengthen, memory for facts and principles, in fields unrelated to spelling.

With a view to determining what words the typical American will need in daily life, extensive research work has been done by a number of investigators. Several years ago, Professor William A. Cook of the University of Cincinnati and Professor M. V. O'Shea of the University of Wisconsin set up an investigation for the purpose of learning what words are actually used in the written communication of American people—of course, spelling does not enter into oral communication. These investigators decided to examine a large amount of correspondence between people in different walks of life, who had varied interests, and

who had received varying amounts of school and college education. The correspondence thus examined was written without the knowledge that it was to be studied for the purpose of determining the spelling needs and spelling vocabulary of the correspondents, so that the authors wrote freely and naturally, without any effort either to extend or to limit their usual spelling vocabulary. The investigators tabulated all the words used by all the correspondents, and then reduced them to a dictionary basis which would show what words actually functioned in the written communication of typical American people. Technical writing of specialists was eliminated, because it was not desired to learn what the spelling vocabulary of technicians and specialists should be.

The findings of these two investigators have since been corroborated by extensive research carried on by a number of persons, so that we are able now to say, with a high degree of confidence, what the general spelling vocabulary of the American people, except specialists, should be. Cook and O'Shea arranged in three groups the words which they found in the correspondence which they examined. In the first group, they placed the words which were used by every correspondent. There were 185 of these words, as follows:

about	every	late	ought
after	far	leave	out
afternoon	feel	let	over
again	few	letter	own
all	find	like	part
almost	first	little	pay
also	food	live	people
an	for	long	place
and	four	look	pretty
another	friend	make	put
any	from	man	quite
around	get	many	rest
as	give	me	right
ask	glad	mine	run
at	go	morning	same
away	guess	much	say
back	have	must	see
be	he	my	seven
before	hear	need	several
boy	help	never	she
build	her	new	show
busy	here	next	six
but	him	nice	so
by	his	night	some
can	home	no	soon
cannot	hope	not	spend
church	hour	nothing	start
come	house	now	such
course	how	of	suppose
day	if	off	sure
dear	in	old	take
do	it	on	talk
down	just	one	tell
enough	keep	only	than
even	know	or	that
ever	last	other	the

their	time	very	which
them	to	visit	while
then	too	want	will
there	town	way	wish
they	train	we	with
thing	try	week	write
this	two	well	year
though	up	what	yesterday
three	us	when	yet
through	use	where	you
	your		

The investigators arranged in the second group all words used by a majority of the correspondents who had contributed material for the investigation. There were 577 words in this list, as follows:

able	big	clear	dress
above	bill	clock	drive
accept	birthday	close	drop
account	bite	cloth	dry
across	black	clothe	during
act	blame	coat	dust
add	block	coffee	duty
address	blood	cold	each
advantage	blow	color	early
afraid	blue	comfort	earth
afterward	board	comfortable	eat
against	body	common	effect
age	book	company	eight
ago	both	compare	either
ahead	bottle	concern	electric
air	bottom	condition	eleven
allow	box	continue	else
alone	bread	cook	enclose
along	break	cool	end
already	breakfast	copy	enjoy
always	bring	corn	equal
among	brother	cost	especially
amount	brown	count	everybody
answer	burn	country	everything
anxious	business	couple	examination
anything	butter	cover	except
anyway	buy	crazy	excuse
appreciate	cake	cross	expect
arrive	call	cup	expense
asleep	car	cure	experience
attempt	card	cut	express
attend	care	dance	extra
aunt	careful	dark	eye
automobile	carry	date	face
avenue	case	daughter	fact
awful	catch	dead	fail
awfully	cause	deal	fair
baby	cent	death	fall
bad	certain	decide	family
badly	certainly	degree	fast
bank	chair	die	fat
basket	chance	difference	father
bath	change	different	fear
beat	charge	dinner	fellow
beautiful	cheap	direct	fifteen
because	cheese	disappoint	fifty
become	chicken	dish	fight
bed	child	divide	fill
begin	chop	doctor	fine
believe	city	dollar	finish
beside	class	door	fire
between	clean	doubt	fit

five	kill	owe	roll	success	thicket	until	whole
fix	kind	pa	roof	suggest	tight	upon	why
flat	kiss	pack	room	suit	till	usual	wife
floor	kitchen	package	safe	summer	tire	vacation	win
folk	lady	paint	satisfy	sun	together	view	wind
follow	land	paper	save	supper	tomorrow	waist	window
foot	large	park	scare	surprise	top	wait	winter
forenoon	lately	parlor	school	sweet	treat	walk	without
forget	learn	party	seat	table	tree	wall	woman
fourth	lesson	pass	second	taste	trip	warm	wonder
free	library	past	seem	teach	trouble	wash	wonderful
front	life	pen	select	teacher	trunk	waste	word
full	light	per	sell	ten	turn	watch	work
fun	line	perhaps	send	terrible	twelve	water	world
funny	listen	person	serve	thank	twenty	wear	worry
further	lose	piano	service	thick	twice	weather	worth
game	lot	pick	set	thin	uncle	west	wrong
gate	love	picture	settle	third	under	whatever	yard
gather	lovely	pie	seventy	thirty	understand	whether	yellow
general	low	piece	sew	thoroughly	university	white	yes
girl	lunch	pillow	shall	throw	unless	who	young
glass	machine	pin	shop			yourself	
grade	mail	plan	short				
grand	manage	play	sick				
great	matter	pleasant	side				
green	may	please	sight				
grind	maybe	plenty	sign				
grip	meal	point	silk				
grow	mean	poor	since				
hair	meet	porch	sister				
half	mention	possible	sit				
hall	mighty	post	sixty				
hand	mile	postscript	size				
hang	mind	potato	skirt				
happen	minute	power	sleep				
happy	miss	prepare	small				
hard	moment	present	smoke				
hardly	money	price	snow				
hat	month	probably	something				
hate	mother	professor	sometime				
head	move	promise	son				
health	music	pull	sore				
heart	myself	quarter	sorry				
heat	name	question	sort				
heavy	nature	quick	sound				
herself	near	quiet	south				
high	nearly	quit	speak				
himself	necessary	rain	special				
hold	neck	raise	spell				
hole	neither	rather	spoil				
horse	nerve	reach	spot				
hot	nine	read	spring				
hotel	noise	ready	stair				
however	none	real	stand				
hurry	noon	realize	state				
hurt	north	really	stay				
idea	note	reason	step				
imagine	notice	receive	stick				
impossible	number	red	still				
improve	o'clock	regard	stock				
inside	offer	remain	stop				
insist	office	remember	store				
instead	often	rent	story				
intend	of	report	stove				
interest	once	request	street				
into	open	return	strike				
invite	order	rich	strong				
iron	otherwise	ride	student				
job	our	ring	study				
join	ourselves	road	stuff				
kid	outside	rock	style				

In the third list, the investigators placed 2,207 words used by some, but by less than a majority, of the correspondents. On account of lack of space, it will not be possible to reproduce this last list, but any reader who is interested can consult Cook and O'Shea's *The Child and His Spelling*, pages 173-219.

In addition to these lists, others including proper names were prepared. But most of these were of a local and personal character, such as the names of particular persons, and of towns, cities, and states, of days of the week, and of months of the year in which the letters were written. It will not be necessary to reproduce the lists of proper names here, although it may be added that the investigators referred to advised that pupils, before leaving the elementary school, should be able to spell the days of the week, the months of the year, and probably the countries of the world and the states of the American Union.

Every pupil's spelling vocabulary, then, should include the words in the first two lists, because they will undoubtedly be needed by most persons in the written intercourse of daily life. Further, in building a bridge, an engineer always provides for a "margin of safety," and he constructs his bridge so that it will bear two or three times the load that he expects it will ever be required to support. So, in learning to spell, one should provide for a "margin of safety," which means that one should probably learn most, if not all, the words in the third list, which Cook and O'Shea found to be used by some, but not by a majority, of the correspondents whose writings were examined. In addition, one should prepare for a possible time of need by learning a few new words that are just coming into general use, such as, "stenotype," "television," and "photophone." One cannot tell at any moment what new word will be retained in the language and become so popular that it will

need to be used by everyone in touch with current affairs. But in America, where everything is plastic and new developments are appearing every day, it is certain that new terms will be constantly coming into the language and circulating freely in written intercourse.

The Use of Rules. In arithmetic, almost everything can be reduced to rule; in spelling, comparatively few rules are possible, and these are no longer taught at the outset, as under the old method. Only when the pupils have mastered enough individual cases to make gener-

alization seem reasonable are the rules introduced. When such derivatives as *plan*, *planning*; *compel*, *compelling*; *run*, *running*, have been mastered, the rule that "monosyllables and words accented on the last syllable, ending in a single consonant preceded by a single vowel, double the final consonant before a suffix beginning with a vowel" may be introduced naturally. All other rules, many of them cumbersome, are to be mastered, if at all, in about the same manner; they must follow and not precede their illustrations. See, also, the article PHONETICS.

Simplified Spelling

As stated in the article PHONETICS, the ideal language would be one in which every letter had but one sound, and every sound was represented by a letter. In such a language, each word would be spelled exactly as it sounds, and spelling would be a very simple matter, once the principles of phonetics were mastered. No speech in the world to-day attains this ideal, and English comes very far short of it. One has but to consider the pronunciation of *tough*, *sough*, *though*, and *through*, to be convinced of this fact.

Many scholars in England and America have from time to time voiced their dissatisfaction with the chaotic state of English spelling, and have attempted to set on foot movements for so-called spelling reform, or simplified spelling. They have always, however, met with determined opposition, both from those who are naturally conservative, and from those who believe that the confusion resulting from any extensive change would be worse than the disadvantages of the present spelling.

In 1886 the American Philological Association and the British Philological Society published a list of 3,500 words, spelled according to a list of rules for simplification announced several years before. Some of these have come into common use since that time, while others are still far from being accepted for general use. The National Education Association of the United States adopted in 1898 the following "reform" spelling, for use in its publications:

altho	demagog	program	thorofare
catalog	pedagog	tho	thru
decalog	prolog	thoro	thruout

In 1906 there was organized in New York the Simplified Spelling Board, which was endowed by Andrew Carnegie and headed by Brander Matthews. Its simplifications were somewhat more sweeping, and were included under sixty-one rules, or recommendations. The Board recommended, for instance, such changes as the following:

1. The use of *e* instead of the diagraph *ae*, except at the end of a word; thus, *medieval* for *mediaeval*; *ether* for *aether*.

2. The omission of the silent *b* before *t*; thus, *dout* for *doubt*; *dettor* for *debtor*.

3. The use of *e* instead of *ea*, in words having the short *e* sound: *hed* for *head*; *helth* for *health*.

4. The dropping of final *gh* when it is silent; as, *thru* for *through*; *tho* for *though*; and the substitution of *f* in such words as *laf* for *laugh* or *tuf* for *tough*.

5. The substitution of *er* for *re* in such words as *theater*, *meter*, or *scepter*.

6. The omission of silent *g* and silent *k* before *n*; thus, *nat* for *gnat*; *naw* for *gnaw*; *nock* for *knock*; *nife* for *knife*.

7. The substitution of *f* for *ph* pronounced like *f*; thus, *fantom* for *phantom*; *sfere* for *sphere*; *trofy* for *trophy*.

A complete list of these rules cannot well be given here, but a study of the above examples will show that some of the simplified forms have already made considerable headway. *Medieval*, for instance, no longer looks strange; *theater* is commonly used; and even *tho* has come to seem fairly familiar.

In August, 1906, President Roosevelt issued an order that reformed spelling of a list of 300 words affected by the rules of the Simplified Spelling Board should be used in government publications. This provoked so much protest that the order was withdrawn. The movement has made slow progress in recent years, although certain of the less radical changes have come into general use, and some newspapers and magazines have adopted a definite style of simplification in the spelling of common words.

Recent agitation in England for legislation in favor of spelling reform has met spirited opposition. Judging by the progress of the spelling-reform movement in the past, it seems likely that any lasting and important changes in the future will be accomplished slowly, through public usage, and not by legislative enactments. M.V.O.S.

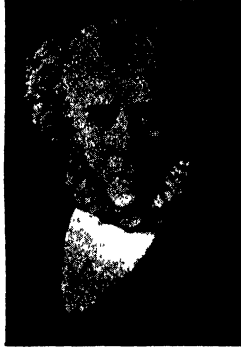
SPELT. See WHEAT (Varieties).

SPELTER. See ZINC.

SPELTER SOLDER. See BRASS.

SPENCER, *spen' sur*, HERBERT (1820-1903), an English philosopher, whose great work was his *Synthetic Philosophy*, was born at Derby. Because of his delicate health in childhood,

the boy's early education was supervised by his father, whose ideas were far in advance of the age. From 1837 to 1846, the young man was in the employ of the London & Birmingham Railway; subsequently, until 1853, he served as subeditor of the *Economist*. This position gave him wide opportunity for studying and writing, and for acquaintanceship with the brilliant people of the period, among them being George Eliot, George Henry Lewes, and John Stuart Mill.



HERBERT SPENCER

While working on his *Psychology*, which appeared in 1855, Spencer undermined his health, and suffered for the rest of his life from chronic insomnia and dyspepsia. The great scheme of his life was the proposed publication of a complete system of philosophy, in which he aimed to outline "in a sweeping, general formula the belief in progress which pervaded his age, and to erect it into the supreme law of the universe as a whole." A complete list of the titles of this *Synthetic Philosophy*, as well as all of his writings, concludes this article.

Spencer's philosophy is chiefly occupied with defining the fields of the knowable and the unknowable. He made neither clear nor definite his expressions regarding the latter, to which, as he found, belong The Absolute, The Infinite, Space, Matter, Time, Force, and Motion. What he aimed to establish was that the very fact that we cannot solve ultimate metaphysical questions compels us to admit the existence of some supreme power behind the unknowable phenomena.

His great contribution to science lay on the positive side, where he dealt with the knowable, and aimed to reduce its laws to unity. The idea of evolution he applied, first, to all forms of organic life, and then to social and political institutions. He declared knowledge is gained by twofold experience, that of the individual and that of the race; inherited intellectual tendencies, therefore, are an important determining factor. The prevailing law which governs the phenomena of nature is the persistence of force: there is continuous order in all things, and a prevalent suggestion of a common origin. Hence, despite his protests, he became a materialist, explaining everything by materialism. He declared all forms of phenomena to be the result of a passing from the simple to the complex. He explained the universe as a gradual development, instead of

accepting the doctrine of creationism (catastrophal or accidental development), often seeming to fail to realize that evolution may be the history of origin, but that it can never be its explanation.

Evolution is his ultimate law of nature, counteracted by one other force, that of dissolution; whether or not there is progress depends on the relative strength of the former. The same formulas that apply to the inorganic world he also applied in explanation of the relations of all phenomena in the organic, the political, the social, and the ethical worlds. Thus he combined with his idea of the persistence of force that of natural selection and adjustment to environment (see EVOLUTION).

Spencer stands as the great representative of the scientific movement of the last part of the nineteenth century. Many of his theories have been disproved by more recent investigations of specialists, but his masterly attempt to satisfy the need of a comprehensive survey of the world as a whole, in terms of facts rather than abstractions, won for him high rank among the great thinkers of all ages.

His Great Works. To Spencer's *Synthetic Philosophy* belong the following volumes: *First Principles*, *The Principles of Biology*, *The Principles of Psychology*, *The Principles of Sociology*, and *The Principles of Ethics*. His other works include *Essays: Scientific, Political, and Speculative*; *Social Statics*; *The Study of Sociology*; *Education: Intellectual, Moral, Physical*; *Various Fragments*; *The Inadequacy of Natural Selection*; *Descriptive Sociology*; and his *Autobiography*, published in 1904.

SPENCER, EDMUND (about 1552-1599), a great English poet of the Elizabethan Age, born at East Smithfield, London. He was sent to the Merchant Taylors' School, then became a student at Pembroke Hall, Cambridge, and in 1576 received from the university the degree of M. A. Two years later, he was taken into the household of the Earl of Leicester, and in 1579 published his *Shepherd's Calendar*. This was dedicated to Sir Philip Sidney, who introduced the young poet in court. The next year, Spencer was made undersecretary to the lord-lieutenant of Ireland, and took part in restoring peace in that country, at the time of Desmond's rebellion.



Photo: Brown Bros.

EDMUND SPENCER

After the year 1586, he lived in Kilcolman Castle in Cork, as possessor of a large estate given him by the government. Here he continued the writing of the *Faerie Queene*, begun

several years before, and, upon the advice of Sir Walter Raleigh, who visited him in 1589, submitted the manuscript at court. The only encouragement given him was a meager pension, and his *Colin Clout's Come Home Again* shows his chagrin at his defeat. However, he published the first three books of his allegory in 1590, and they were eagerly received by the public. Somewhat later appeared a volume of short poems entitled *Complaints*.

After his return to Ireland, Spenser married a lady whose given name, Elizabeth, alone is known. The courtship was described in the *Amoretti*, a series of sonnets, and the marriage was made memorable by the *Epithalamion*, the finest of English wedding songs. The year 1596 is notable as that in which appeared three more books of the *Faerie Queene*; *Four Hymnes*, celebrating love, beauty, heavenly love, and heavenly beauty; and the fine *Prothalamion*. At this time, too, was written the *Present State of Ireland*, not published for many years. These productions, however, did not advance him at court, and he returned from another visit to England more discouraged than ever. Two years later, his castle was broken into and burned by Irish rebels, and he narrowly escaped with his family. Not long afterward, he died in a London inn.

The *Faerie Queene*, though not completed, ranks among the greatest narrative poems in the literature of the world. It was the author's intention to make the allegory consist of twelve books, in which twelve moral qualities should be embodied in as many knights, representing chief personages of the day, as Raleigh and Drake. However, only six books, and two cantos of *Mutabilitie*, were written. The form of stanza Spenser used has since been given his name, and has been used by other writers, notably by Byron in *Childe Harold*, Keats in the *Eve of Saint Agnes*, and Burns in the *Cotter's Saturday Night* (see SPENSERIAN STANZA). The music of the verse, the beauty of sentiment, and, above all, the exquisite fancies called into being by a wonderful imagination, are the chief merits of the *Faerie Queene*, which has so profoundly impressed many of the later great poets that Spenser is called by some "the poet's poet."

SPENSERIAN STANZA, a verse form originated by Spenser for his *Faerie Queene*. It is a nine-line stanza, the first eight lines containing ten syllables each, the last twelve syllables, while the rhyme scheme is *ababbcbcc*. It is a very stately form of verse, and while many English poets have attempted to imitate it, few have known how to handle it in a manner worthy of its inventor. Among famous poems written in Spenserian stanza since the *Faerie Queene* are Keats's *Eve of Saint Agnes* and Byron's *Childe Harold*. It is through this last poem, probably, that most readers are

familiar with its stately music and its slow movement. See SPENSER, EDMUND.

SPERMACEITI, *spur' ma se' tih*, a waxy substance obtained from cavities in the head and from the blubber of the sperm whale. Spermaceti of the best quality is found in the thick, oily head fluid. By a process of trying out and cooling, this fluid is separated into sperm oil and a mass of flaky white crystals. The latter constitute the spermaceti of commerce. An ordinary whale yields about twelve barrels of the raw material. When purified, spermaceti is a smooth, translucent solid, practically tasteless and odorless, and similar to tallow in appearance. It can be dissolved in hot alcohol and ether, and burns with a bright flame. Though formerly employed to a considerable extent in making candles, and to give weight to dress goods, it is now valued chiefly as an ingredient of ointments and cosmetics. See WHALE; WAX.

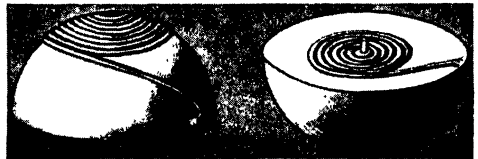
SPERMATOPHYTES, *spur' ma toh fites*. See BOTANY (Classification).

SPHALERITE, *sfal' ur ile*. See ZINC.

SPHENOID, *sfe' noid*, **BONE**, one of the eight bones in the head (which see).

SPHERE, *sfeer*. A curved surface, all points of which are equally distant from a point within, is called a *sphere*. The point within from which all points of the surface are equally distant is called the *center*. The distance from the center to the surface is the *radius*. The distance from any point on the surface through the center to the opposite point on the surface is the *diameter*.

Surface of Sphere. Cut a sphere into two equal parts. Wind a cord about the whole convex surface of one of the hemispheres; then



[Explanation appears in text.]

wind this same cord about the entire plane surface or base of the hemisphere (which is a *great circle of the sphere*). You will find that the cord which covers the *convex* surface will cover the *great circle* twice. Stated as a rule, this is expressed: *The area of a sphere is equal to the area of four of its great circles*. The area of a circle equals 3.1416, or π (pi), times the square of its radius (see CIRCLE). Therefore the surface of any sphere = $4 \times \pi \times \text{radius}^2$.

What is the surface of a sphere whose diameter is 12 feet?

Surface in sq. ft. = $4 \times 3.1416 \times 6^2 = 452.3904$.

Volume of Sphere. Take a cylinder of the same diameter as a sphere, and of an altitude

equal to the diameter of the sphere. (1) Fill the cylinder with water, and in it place the sphere; hold the sphere firmly so that it rests on the base of the cylinder (does not float), and thus displaces its own volume of water. When the sphere is taken out, the cylinder is found to be one-third full of water, which shows that *the volume of the sphere is two-thirds of the volume of the cylinder.*

(2) Place the sphere in the empty cylinder; fill in with salt, sugar, or sand; take out the sphere, and find that the salt, sugar, or sand fills the cylinder to one-third of its height.

(3) The two solids may be made of clay or putty and weighed, and the relative weights noted.

All these experiments show that *the volume of a sphere is two-thirds the volume of a cylinder whose diameter and whose height are each equal to the diameter of the sphere.*

Volume of any cylinder = area of base \times height
 Volume of cylinder = $\pi \times r^2 \times \text{height}$

But in this cylinder, the height is equal to diameter, or twice the radius (see CYLINDER).

Volume = $\pi \times r^2 \times 2r$

Volume = $2 \times \pi \times r^3$

and

Volume of sphere = $\frac{2}{3} \times (2 \times \pi \times r^3)$

Volume of sphere = $\frac{4}{3} \times \pi \times r^3$

Volume of sphere = $\frac{4}{3} \pi r^3$

Find the weight of a steel ball 20 inches in diameter, steel weighing 480 pounds to the cubic foot.

Volume of sphere = $\frac{4}{3} \pi r^3$

Weight in lb. = $\frac{4 \times 3.1416 \times 10^3 \times 480}{3 \times 1728} = 1163\frac{1}{2}$

The surfaces of spheres are to each other as the squares of their radii. The volumes of spheres are to each other as the cubes of their radii or the cubes of their diameters. The volume of a sphere is, roughly, one-half the volume of a cube whose edge is equal to the diameter of the sphere. J.W.V.

SPHERICAL ABERRATION, *sfehr' ih kal ab ur a' shun*. See ABERRATION.

SPHEROID, *sfe' roid*, a geometrical body resembling a sphere, but not perfectly round. In geometry a spheroid is a figure generated by an ellipse revolving about one of its axes. The spheroid is called *prolate*, or *oblong*, when it revolves about the longer, or major, axis of the generating ellipse; when it revolves about its shorter, or minor, axis, it is said to be *oblate*. The figure of the earth is frequently referred to as an oblate spheroid, as its polar diameter is slightly shorter than its equatorial diameter (see EARTH). J.W.V.

SPHINX, *sfigks*. In Grecian mythology, the sphinx was a wicked being usually represented as a lion, having the head of a woman, the tail of a serpent, and the wings of a bird. This creature lived in a cliff just outside the city of Thebes, and kept guard over the road to the

city. To every passer-by she put this riddle: What animal is it that walks on four legs in the morning, two at noon, and three in the evening? And anyone who failed to answer correctly was immediately devoured. When Oedipus passed on the way to Thebes, the riddle was put to him, and, without much hesitation, he declared the animal to be man, who walked on his hands and feet when young, erect on his two feet in middle life, and with the aid of a staff in old age. With a howl of rage because her riddle had been read aright, the sphinx hurled herself from the rocks and was killed.

The Egyptian Sphinx. This mythical creature was not quite like the Grecian, but had the head of a man and the body, legs, feet, and tail of a lion. It had no wings until a later period, when the Greek influence was felt. Originally, the sphinx was supposed to represent the god Horus, guardian of temples and tombs; and when sculptured the face was probably made to resemble the Pharaoh who ruled at that time. Sometimes sphinxes lined both sides of an avenue leading to a temple, as at Karnak.

The Great Sphinx, a marvelous reminder of Egypt of old, stands close to the Great Pyramid at Gizeh; it is one of the most impressive monuments in Egypt, and is carved out of solid rock, excepting the paws, which are built of masonry. It was the custom to execute royal portraits in the heads of sphinxes, and it is believed that the Great Sphinx bears the features of the Pharaoh who built it. The great figure is 172 feet long and sixty-six feet high, its head is thirty feet in length, and the width of its face is fourteen feet. These figures give some idea of its enormous size, but it is impossible to convey any idea of the expressiveness of its scarred features. The Arabs mutilated the face shamefully, using the head as a target for their guns. The age of the Sphinx is unknown, but it is considered well established that it was in existence at the time of Cheops, and was repaired by him earlier than 3000 B.C.

The sands of the desert are continually burying the base of the monument, and only through excavations, made at great intervals, have the huge paws and body of the beast been made visible. In 1926 the sands which for 3,000 years had been accumulating and hiding the lower part were cleared away, and repair work was completed which revealed this ancient monument in new and greater glory. Thothmes IV had been the last to remove the sand. At the same time, he had made a few additions and repairs, and painted all but the head in red. Remnants of his work and the paint were found in the recent excavations.

SPHINX MOTH. See HAWK MOTH.

SPICA, *spl' kah*, a star. See ASTRONOMY (The Heavens in Spring).



The Great Sphinx, After Its Feet Were Uncovered in 1926. Before the excavation, the desert sands had buried not only the gigantic feet, but also the upright portion, as high as the dark line across the figure which appears above the considerable black space. (See page 6738.)

Photo: Wide World

SPICE, the general name for a group of pungent and aromatic vegetable products, used chiefly to season foods. The various spices, such as pepper, nutmeg, cloves, ginger, allspice, mace, mustard, cinnamon, and capsicum, are derived from different parts of plants; for example, cloves are procured from the bud, cinnamon from the bark, pepper and nutmeg from the fruit, ginger from the root, and mustard from the seed. The food value of spices arises not from their nutritive content, for their percentage of nourishment is small, but from the stimulating effect they have on the digestive organs. They should, however, be used with moderation, as excessive use of any seasoning is injurious. The cultivation of spice plants is an important industry in many tropical countries.

B.M.D.

Related Subjects. The following spices are described in these volumes:

Allspice	Caraway	Coriander	Mustard
Anise	Cardamom	Cubebs	Nutmeg
Caper	Cinnamon	Ginger	Paprika
Capsicum	Cloves	Mace	Pepper

SPICE ISLANDS. Because of their production of spices, this name is often applied to the Moluccas (which see).

SPICES, ADULTERATION OF. See **ADULTERATION OF FOODSTUFFS AND CLOTHING (Flavoring Extracts and Spices)**.

SPICULE, *spik' yule*. See **SPONGE**.

SPIDER, one of a group of animals that are of special interest because of their ability to spin beautiful silken webs. The purpose to which some of these dainty gauze structures are put is known to every child who has learned the poem beginning—

"Will you walk into my parlor?" said the spider to the fly.

"'Tis the prettiest little parlor that ever you did spy;
The way into my parlor is up a winding stair,
And I have many curious things to show when you are there."

"Oh, no, no," said the little fly, "to ask me is in vain,
For who goes up your winding stair can ne'er come down again."

Many an insect, however, is not so wary as the fly of the poem, and meets its death in the silken meshes.

General Description. The spider itself is not an insect, though zoologists at one time included it among the Insecta. According to modern classification, spiders belong to a class called Arachnida (which see), to which belong also mites, ticks, and scorpions. Arachnids have two body divisions—a forepart consisting of a united head and thorax, and an abdomen. In case of the spider, the two parts are connected by a slender, flexible stalk. Insects have three body divisions and four wings. Spiders have no wings.

Another point of difference is the number of legs. Insects have three pairs, while spiders and nearly all other arachnids have four. The

long, thin legs of a spider have seven joints, and they end in tiny claws. In some species, the legs are so arranged that the animal can move in any direction—forward, backward, and sidewise. There are two other pairs of appendages. These are in the nature of jaws, or

mandibles. The first pair end in pointed fangs, from which is ejected a poisonous secretion, used in killing the spider's prey. So small an amount is ejected that a human being bitten by a spider usually suffers no more discomfort than from a mosquito bite. The second pair of jaws is used in grasping and holding the victim.

Most spiders have eight eyes, borne on the front of the head. Antennae, or feelers, are lacking. The breathing organs consist of two sacs, each containing several thin tissues ar-

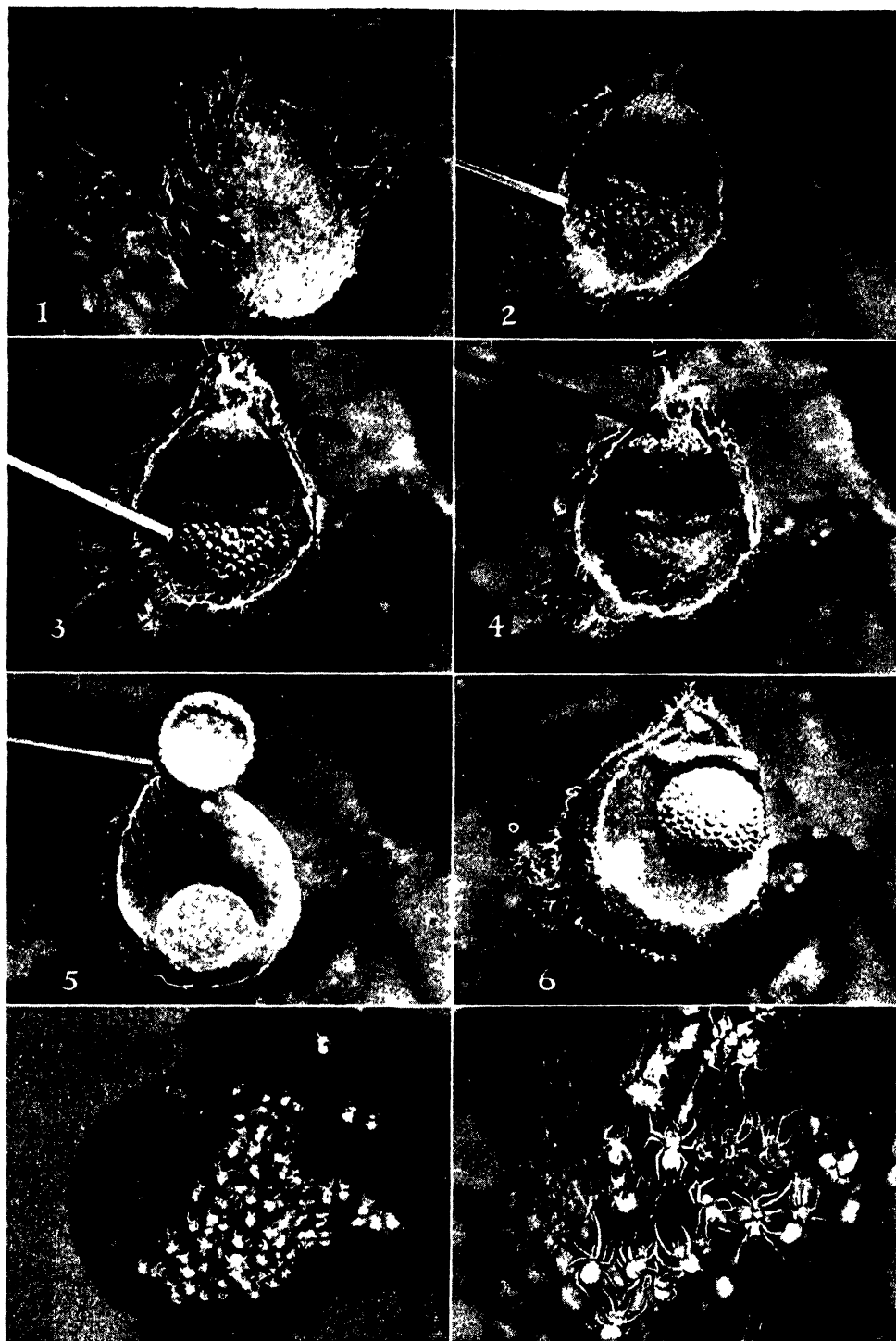


EXTERNAL VIEW OF UNDERSIDE OF SPIDER

- Abdomen
- Fourth pair of legs
- 1. Mandible
- 4. Opening to breathing organ
- 5. Opening to reproductive organs
- 6. End of alimentary canal
- 7. Eyes

anged like the leaves of a book; slits on the under side of the abdomen open into these sacs. There are three pairs of spinnerets, small tubes borne on the end of the body. From these is exuded a sticky liquid secreted by glands in the abdomen. This substance forms the silky threads of the web. The mouth is simple, as spiders feed on blood sucked from other animals.

The Weaving of the Web. The spider does most of its spinning at night or in the early morning. It raises its spinnerets in the air, and, by gently pressing them against some object, causes the liquid silk to flow out. The threads harden when they come in contact with the air, and unite into one strand. With this thread, the spider makes a suspension bridge, tightening it with its claws and firmly cementing it to a beam, leaf, or wall. On several of these strands is hung the gossamer net, which is of various shapes. The web of the common house spider consists of a number of crisscross strands woven around the supporting spokes and forming an irregular wall around a central space. When any part of the web is broken



Development of the Garden Spider. (1) The egg sac in early September. (2) The sac exposed to interior view. (3) Eggs exposed to view. (4) Shows how the mouth is closed with an ingenious stopper. (5) The silky underside of the stopper. (6) Eggs with silk removed. (7-8) Baby spiders; they remain in the sac until spring.



Photo: Herbert

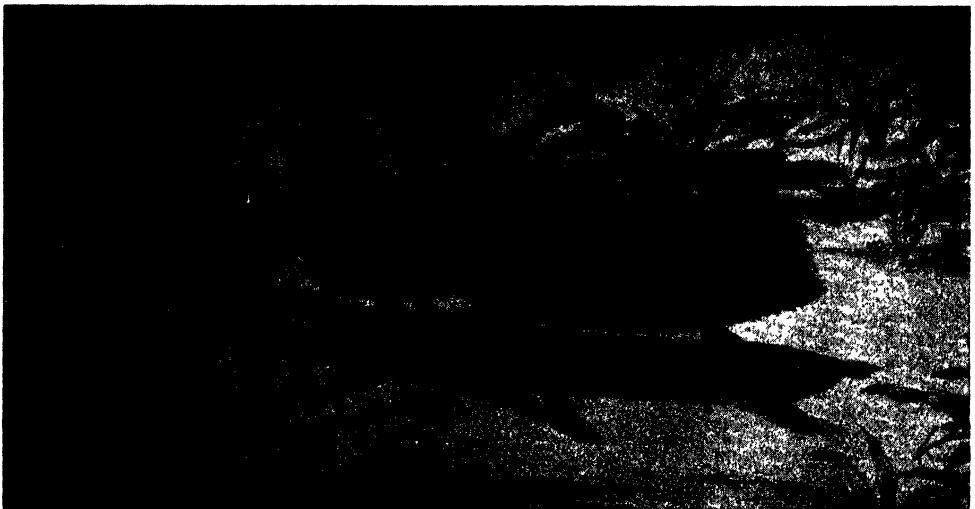
A PERFECT WEB AND ITS WATCHFUL OCCUPANT

The spider requires not more than half an hour to spin the geometrically patterned fabric which serves it as a refuge and as a snare for food. Finer than the finest hair and comparatively stronger than steel, the strands of the spider's web are capable of enmeshing insects much larger than the voracious builder.

the spider immediately makes repairs, but after it has spun several webs, its stock of silky fluid is for a time exhausted, and it often takes possession of the home of some other spider.

Of all the wonderful structures made by the lower animals, the orb web of the large black

and yellow garden spider is one of the most delicately designed and skilfully made. This geometric web consists of delicate spiral strands fastened to spokes arranged like those of a wheel, and is fixed to a branch or leaf with threads resembling the ropes of a tent. The



HOW A MOTHER SPIDER CARRIES HER YOUNG

net is hung vertically, that flying insects may hit against it and be entrapped. The spider is never entangled in its own web, because it runs on the radiating strands, or spokes; the sticky, spiral threads are covered with minute, pearl-like drops of the glutinous substance, to hold the captive insect firmly.

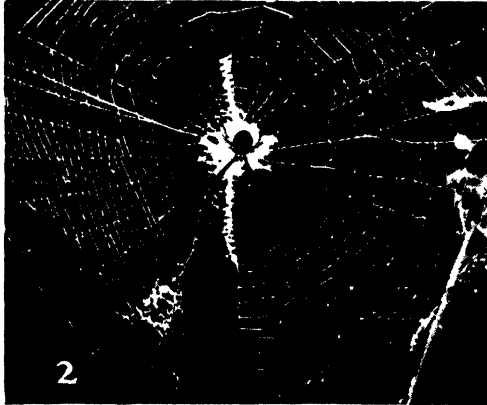
The delicate, filmy dome is another vertical web of the field and garden, and is suspended with the opening at the lower side. The single, shining threads which are often hung from grass stalk to grass stalk are spun by the young spiders. Sending out a thread of silk into the air, they float off with the breeze, and, spinning more thread as they go, they are blown to new fields. The *flying*, or *ballooning*, spiders, thus sailing through the air, have been found in mid-ocean; it is in this way that spiders are distributed over the globe.

Habits and Characteristics. There are numer-

ous species of spiders, found all over the world, and differing considerably in habit. The largest, found in the tropical regions of South America, are two or three inches long. These creatures prey not only on insects, but on humming birds. Another interesting species is the *trapdoor spider*, which makes a silk-lined burrow in the ground, and covers the entrance with a lid made of silk, leaves, and soil. The *crab spider*, so called because it can move backward, assumes the color of the flower on which it lives, and hides in the heart of the blossom, waiting there for the unwary insect which will

come in search of nectar. The interesting *water spiders* build a water-tight, silken nest in the water, and inflate it by bringing down to it bubbles of air carried in the hairs on the body. *Hunting spiders* do not spin webs, but catch their prey by pouncing on it. To this group belong the tarantulas and trap-door spiders. The *black widow*, which is common in the Southern United States, is the most poisonous American spider.

Spiders reproduce by eggs. The female, which is usually much larger than the male, makes a dainty silken cocoon for her eggs, which sometimes number many hundred. These egg cases are usually attached to the end of the mother's body. It often happens that the males are attacked and killed by their larger mates. It is usually the female that spins the web and obtains the food supply. Spider silk could be made commercially profitable for use in the



THE GARDEN SPIDER

(1) A good view of the yellow-marked garden spider. (2) A victim enmeshed in his web. (3) Leaping upon his prey.

ous species of spiders, found all over the world, and differing considerably in habit. The largest, found in the tropical regions of South America, are two or three inches long. These creatures prey not only on insects, but on humming birds. Another interesting species is the *trapdoor spider*, which makes a silk-lined burrow in the ground, and covers the entrance with a lid made of silk, leaves, and soil. The *crab spider*, so called because it can move backward, assumes the color of the flower on which it lives, and hides in the heart of the blossom, waiting there for the unwary insect which will

textile industry, if enough could be obtained. This is not possible, because any number of spiders placed together in an enclosure would eat each other up. These creatures are among the most shameless cannibals in the entire animal kingdom. Spiders themselves are preyed on by other creatures, but the wasps are their worst enemies. These kill large numbers of spiders, sealing them up in their cells for their young to feed on. S.H.S..

Legends of the Spider. There are many interesting stories and superstitions surrounding the spider. The lesson the patient spider taught Robert Bruce

of Scotland (see his biography in these volumes) is well known.

The old superstition that a fever could be cured by wearing a spider in a nutshell fastened around the neck is mentioned by Longfellow in the tale of *Evangeline*.

The Arachne Myth. There is a pretty Greek myth explaining the spider's origin. It tells of a beautiful maiden, called Arachne, who boasted of her spinning and was punished for her pride by the jealous goddess Minerva, who changed her into a spider.

Scientific Names. Spiders constitute the order *Araneida* within the *Arachnida*. This order is divided into several families, including *Aviculariidae*, the trapdoor spiders; *Epeiridae*, round-web spiders; and *Thomisidae*, the crab spiders.

Related Subjects. The reader is referred in these volumes to the following articles:

Antennae
Arachne
Arachnida
Mythology
Tarantula
Wasp

SPIDER WEB, a structure spun by the spider to ensnare its enemy and protect its home. It is described in detail in the article **SPIDER**.

SPIEGELEISEN, *spe' gel i zen*. See **MAN-GANESE**.

SPIKENARD, OR NARD, a costly perfume yielded by a plant of the valerian family, native to India. The root of the plant, which is shaped like a spike, or ear, of corn, bears at the top a cluster of thick stems about two inches long, and it is this part that is principally collected for the extraction of perfume. The precious ointment of spikenard mentioned in the Bible (see *Mark* XIV, 3-5, *John* XII, 3-5) was probably an oil or fat scented with the perfume. The odor of spikenard is not especially agreeable to people of Western countries, but those of the Orient have prized the perfume for cen-

turies, and the ointment was used by the Romans in connection with the bath.

In Southern Canada and the Northern United States is found an aromatic herb which is used in making a tonic. This is called *American spikenard*, or *Indian root*; it is a member of the ginseng family. B.M.D.

Scientific Names. The Oriental plant which produces spikenard belongs to the family *Valerianaceae*. Its botanical name is *Nardostachys jatamansi*. The American species mentioned above belongs to the family *Araliaceae*. Its botanical name is *Aralia racemosa*.

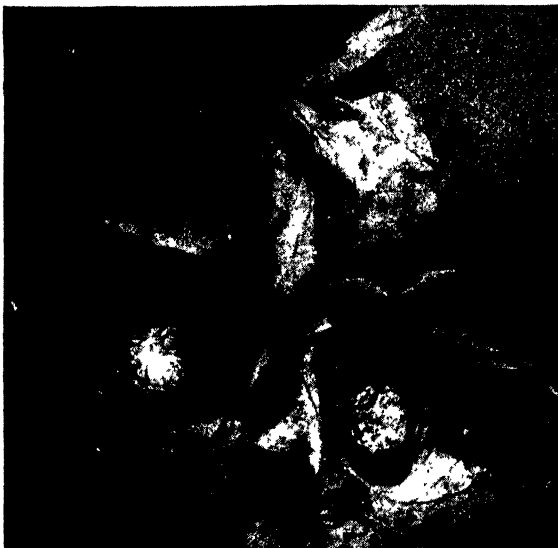
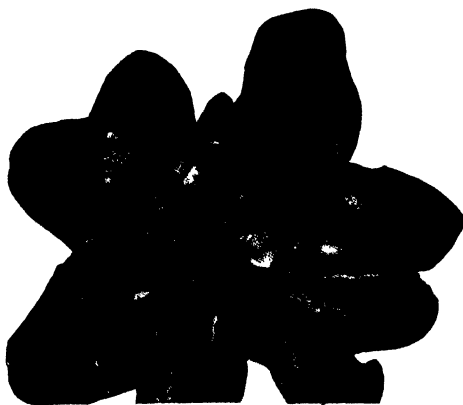


Photo: Visual Education Service

SPIDER BALLS

The eggs are seen on the stems of dead leaves.



SPINACH

is rich in iron and contains vitamins (which see), both constituents having an important bearing on health. Spinach is also strongly laxative, for it has a large amount of cellulose, or roughage. It is one of the best vegetables for children, and may be had during the entire winter, for the plant is hardy and can be grown during cold months. In the vicinity of Norfolk, Va., a tender, delicately flavored variety known as *Norfolk Savoy* is grown in large quantities for the Northern markets. Sowings are made in the fall, and the crop is harvested at intervals during the cold weather. Farther north the plant is grown as an early spring crop. Spinach requires a rich soil, as plants grown in poor soil bear leaves that are tough and bitter. The seed is usually sown in drills an inch deep and a foot apart.

There are two general classes: *prickly spinach*, with arrowheaded leaves and a fruit pod covered with spines; and *smooth spinach*, with round leaves and smooth fruit. The most careful washing is necessary in preparing spinach for the table, since the leaves are always full of sand and grit. B.M.D.

Scientific Name. Spinach belongs to the family *Chenopodiaceae*. Its botanical name is *Spinacia oleracea*.

SPINAL CORD, the largest nerve trunk in the body. It is located in the spinal column, extends from the base of the brain to the lumbar vertebrae, and is composed of gray and white matter. Separating the spinal cord from the bony spinal column are three protective membranes continuous with those which surround the brain (see BRAIN). A liquid known as the *spinal fluid* is contained in a cavity between these membranes. Inflammation of the membranes is known as *meningitis*. It is a very serious condition, and is, unfortunately, not uncommon. Examination of the spinal fluid gives information as to the condition of the membranes. The spinal nerves branch off from it. For a full description, see NERVOUS SYSTEM (Spinal Cord). K.A.E.

SPINAL NERVES. See NERVOUS SYSTEM.

SPINIFEX, *spin' ih feks*. See AUSTRALIA (Plant Life).

SPINNING, an ancient household industry that has found its way into great modern factories. It is a process of making threads by twisting vegetable or animal fibers, and was originally accomplished by means of a spindle and distaff. The spindle was a stick from nine to fifteen inches long, tapering at both ends, and having a notch at one end for catching the thread; the distaff was a staff upon which the fibers were bound in a loose coil. The spinner rotated the spindle by rolling it against the thigh with the right hand, while

the fibers were gathered and arranged with the left. With such a primitive device, the ancient Egyptians made threads that were woven into fabrics of the finest quality. Toward the middle of the sixteenth century, the progress of spinning was aided by the invention of a spinning wheel (see illustration). This was the type of spinning machine, used by the housewives of New England in colonial days, which appears so often in picture and story.

Spinning, however, was destined to undergo a complete revolution. This was the result of

three notable inventions of the eighteenth century—the spinning jenny of James Hargreaves, the cotton-spinning machine of Richard Arkwright, and the mule spinner of Samuel Crompton. Though numerous improvements were perfected during the nineteenth century, which vastly increased the output and made possible a product of higher quality, all modern machinery is based on eighteenth-century models.

Cotton-spinning as carried on in a modern factory may be taken as a type. After the raw cotton has been cleaned and

arranged into laps of uniform size, it is carried to the carding machines, equipped with huge rollers covered with wire teeth, where the tangled fibers are straightened out and made to lie in straight, even rows. Then the fibers are rolled over and over one another to form *slivers*, which look like loose ropes of soft cotton yarn. A sliver goes through the processes of *drawing*, *slubbing*, and *roving*, by which it is twisted and retwisted and made continually finer and stronger. The concluding operations are carried out in the spinning machines, in which the thread is finally given the required twist, firmness, and strength. See COTTON.

Spinning Wheel. This was the first mechanical arrangement for applying a rotary motion to a spindle, for spinning cotton or flax into threads. The principle was the same as that of



Photo Keystone

A GERMAN WOMAN AT HER SPINNING WHEEL

the spindle used by hand, but when the spindle was mounted horizontally, and a band or small belt was passed from a groove in the spindle over a large wheel, turning the wheel by the foot gave the spindle a more uniform motion.

The material to be spun was carried on a distaff. The wheel was turned with the left hand or foot, the material being drawn out by the right hand. The degree of fineness depended on the rapidity with which the twisting thread was drawn out. For very fine thread, two spinnings were necessary. Before the development of cloth-making in factories, the spinning wheel was as common in the home as the sewing machine is to-day.

Spinning Jenny, a device invented about 1764 by James Hargreaves, of Lancashire, England, by which sixteen or more threads could be spun simultaneously (see HARGREAVES, JAMES). The name *jenny* is derived from *gin*, which was the local term for *engine*. In the spinning jenny, spindles were placed vertically and were rotated by a wheel worked by hand. It was found very serviceable for spinning coarse thread, but unsuitable for fine work. The jenny was replaced by the *mule*, which contained most of the important features, with improvements.

SPINOZA, *spi' no' zah*, BARUCH [BENEDICT] (1632-1677), a Dutch-Jewish philosopher, born in Amsterdam. His parents had fled from Catholic persecution in Portugal, and in the Netherlands he received careful instruction in Jewish theology. Under the influence of the philosophy of Descartes and Giordano Bruno, he broke with the Jewish faith, and his heretical views brought about his excommunication in 1656. In his insistence on maintaining a position granting absolute freedom of thought, he lived in solitude at The Hague, depending for a living on the profits from lens-making, in which he was proficient, and declining both the position of professorship at the University of Heidelberg and the pension offered him by Louis XIV of France. His life was lonely, cheered only occasionally by the companionship of a few friends. Gentle, sensitive, heroic, with constitution weakened by consumption, he lived a life of seclusion and, in contemplation of God and spiritual realities, tried to make vital and real the philosophy he taught.

His philosophy was derived from that of Descartes, and developed into a complicated pantheism. It declared that God exists, and that His manifestations, or attributes, are two: extension (that is, the world of material things) and thought. It denied any causal relation between mind and matter, and so he had to apply a theory of parallelism to explain what was apparently interaction between the two. For every idea there is a physical object; for every material thing a corresponding particular idea. Though the physical and ideational

causal series never interact, both are dependent on God, the Substance and Creator. Man is not free: God alone is free. That is, man is a limited manifestation of God, and God alone is Cause, Effect, and Purpose. Man's attention must be riveted on the spiritual, for whenever particulars blind him and remain his ideal, harm and evil result.

His conception of God, wholly different from the Christian one, laid him open to charges of atheism. As he developed it into a philosophy, it can better be described as an elaborate abstract monotheism.

Related Subjects. The reader is referred in these volumes to the following articles:

Atheism
Descartes, René

Pantheism
Philosophy

SPIRACLES, *spi' a k'lz*. See INSECT (Internal Structure).

SPIRAEA, *spi re' ah*, a genus of herbs and shrubs belonging to the rose family, widely distributed throughout temperate and cold regions of the northern hemisphere. They bear beautiful white, pink, or rose-colored flowers, and many of the species are cultivated as ornamental plants. Among the best of these are *Van Houtt's spiraea*, a hardy shrub with dense, deep-green foliage; *Thunberg's spiraea*, which has leaves of more delicate character; the *hardhack*, or *steeplebush*, adapted for mass planting, having flowers in narrow, crowded clusters; and the *plum-leaved spiraea*, described elsewhere in these volumes under the title



SPIRAEA

BRIDAL WREATH. Another well-known species, commonly called *meadowsweet*, is regarded as a troublesome weed in New England. B.M.D.

Scientific Names. The genus belongs to the family *Rosaceae*. Van Houtt's spiraea is *Spiraea vanhouttei*; Thunberg's, *S. thunbergii*; the hardhack, *S. tomentosa*; the bridal wreath, *S. prunifolia*; and the meadowsweet, *S. latifolia*.

SPIRAL NEBULAE. See NEBULA.

SPIRE, in architecture, that part of a tower or steeple which rises from the top in the form of a pyramid. (For examples, see illustrations under CATHEDRAL.) In the earliest form, the spire was little more than a slightly raised, four-sided roof, but gradually these structures became taller, more slender, and usually octagonal in shape. The cathedral at Cologne, Ger-

many, has spires over 500 feet high, while the finest spire in England, that on Salisbury Cathedral, is 406 feet in height. The spire of the First Methodist Church in the Loop district of Chicago reaches 556 feet. The general effect of a building surmounted by spires is very striking. In Milton's *Paradise Lost*, these lines occur:

The glorious temple rear'd
Her pile, far off appearing like a mount
Of alabaster, topt with golden spires.

SPIRES, DIET OF. See PROTESTANT.

SPIRILLUM, *spi ril' um*. See BACTERIA AND BACTERIOLOGY (Kinds).

SPIRIT LAKE. See IOWA (Its Waters).

SPIRIT LEVEL. See LEVEL.

SPIRITS OF CAMPHOR. See CAMPHOR.

SPIRITS OF HARTSHORN. See AMMONIA.

SPIRITUALISM. The term usually refers to the modern form of the belief in the survival and communication of the spirits of the departed. This grew out of certain disturbances in a house at Hydeville, N. Y., in 1848; the disturbances appeared in the presence of the two Fox sisters, and consisted of raps and mysterious moving of objects. By agreement that one rap should mean "No," and three "Yes," the knocker revealed himself, in answer to questions, as the spirit of a murdered peddler. The movement found favorable soil and grew rapidly to enormous proportions. Mediums appeared everywhere, and spiritualists were numbered by the hundreds of thousands; "seances" were widely held and spread to England and the Continent, at which eager sitters sought communication with deceased relatives, and in that intercourse found a religious consolation.

The seances took the form of movements, apparently without physical contact, of table-tipping and floating of objects; of communications through the medium, who was sometimes in a trance state; of spirit materializations; of writing on sealed slates; and of a variety of startling performances which one and another medium devised. Prominent in the group were the performances in a "cabinet," which the medium entered securely bound, while bells were rung, tambourines played, chairs overturned, and faces appeared almost as soon as the "cabinet" doors were shut; when opened, the medium seemed as securely bound as ever. Trance mediums contributed elaborate messages describing the spirit world, and sought to prove the identity of their source by references to the great personages of past ages.

This bare account of the movement gives no suggestion of the intensity of the interest and the absorption in mediums and their doings, which was widespread for two or three decades. Mediums were frequently detected in

frauds of the most flagrant character, and the many failures were referred to unfavorable skeptical conditions. Investigations of a more or less critical character were made from time to time; but it was not until those made under the auspices of the Seybert Commission (1888), by the committees of the Society for Psychical Research, and by investigation with a knowledge of conjuring, that the fraudulent character of most of the manifestations was minutely analyzed. See PSYCHICAL RESEARCH; CONJURING.

On the other hand, these newer investigations, together with the proposal of telepathy as a possible explanation, the trance revelations (of Mrs. Piper and others), and the automatic writings of unprofessional mediums, brought the spiritualistic hypothesis again to the front. Some investigators concluded that the revelations thus emerging, so far beyond the knowledge of the mediums, and the frequency of premonitions and apparitions corresponding with the moment of death of the person communicating, all pointed to the spiritualistic as the only adequate explanation of the source of the messages.

Historically, modern spiritualism is connected with the unbroken series of "occult" interests and manifestations that stand as the heritage of magical belief and gave rise to the pseudo-sciences [see SCIENCE AND THE SCIENCES (Pseudo-Sciences)]. More particularly, the performances of somnambules (see HYPNOTISM) in a "mesmeric" state set the pattern for the reading of sealed messages, seeing without eyes, and similar performances which formed the stock in trade of the spiritualistic mediums. Again, the table-tipping and -rapping were already current (particularly in France), and were readily used for spiritualistic communication; they are examples of unconscious movements (see SUBCONSCIOUS). Finally, the apparitions, haunted houses, and noisy spirits have always been reported as part of popular belief and referred to a spirit origin. Thus modern spiritualism is essentially a revival of a general belief adopting newer modes of expression (and in its most recent phases raising issues more scientifically stated), which has a long history and has served to satisfy a certain type of interest and inquiry; such interest is closely related to the "occult." The loose character of the evidence, the invitation to fraud and self-delusion, the emotional interest in the issue, the contagious spread, the attraction of such beliefs to those of unstable mental disposition—all contribute to the readiness with which the spiritualistic performances were made to support unscientific belief and to conceal true motives for the popularity of the idea.

A critical investigation of spiritualism distinguishes the physical phenomena and the

spiritual or revelational. The former consist of appearances seemingly defying the laws of physics; typically, they involve the assumption that the effect could not be ascribed to the ordinary agency of the medium. There is absolutely no connection between the failure to detect the manner in which the performance (or trick) is done and the conclusion that it is to be referred to a spirit. Nothing is more constant in the annals of spiritualism than the emphatic statement of investigators that fraud was eliminated, and yet the result was shown to be nothing more than a bare-faced or shrewd trick. Mediums have made international reputations, and there have been performances heralded as marvelous and endorsed by men of great reputation and scientific distinction; yet a proper investigation readily disclosed the method.

The best-known of such instances is the case of Eusapia Paladino, whose performances involved nothing more than the movement of a light table or the disturbance of objects in a draped corner, while apparently her hands and feet were controlled. As a fact, she is remarkably skilful in concealing the action by which she moves table and objects, and in escaping from the control of the sitters. Substantially, all the authentic performances of mediums have been repeated by conjurers; while in such tricks as slate-writing, the whole effect depends upon the illusion of the sitter that he has had constant sight of the slates, or upon the failure to detect the substitution of a prepared slate, or upon the action of the table to serve as a screen while the message is written under the table. A piece of gauze, a low light, an expectant atmosphere, and a convinced sitter will create a recognized spirit; while releases from ties and knots prove nothing but the adroitness of the medium. The vulgar atmosphere of fraud surrounding the physical performances is established. Yet they have served an educational purpose in proving how treacherous is unimpeachable evidence, how elusive fraud may become, how technical is the skill needed to discover it, how readily bias makes marvels out of plain tricks.

The revelational evidence (apart from the crude answers to questions in an ordinary seance) is of a different nature. It depends for its value upon its intrinsic character; upon the probability that the medium could not have attained it by ordinary means; upon the corroboration of the revelations. This type of evidence is difficult to estimate; the opportunities for exaggeration and delusion are subtle; more than all else, the coöperation of the medium (who may be in a trance state) is indispensable, and is not readily secured. It is the impressiveness of cumulative revelation that makes converts to the spiritualistic hypothesis of survival and communication of the departed. While

keeping as open-minded a reserve as is compatible with a scientific attitude, one may yet maintain that recent studies in psychology, which prove the extreme subtlety of the mind's operations and the large part played by subconscious tendencies, will eventually account for the revelational aspect of evidence. J.J.

Relating to Various Beliefs. The articles in these volumes on the following topics are of interest in this connection:

Alchemy	Necromancy
Astrology	Occult
Clairvoyance	Palmistry
Conjuring	Phrenology
Demonology	Physiognomy
Divination	Psychical Research
Ectoplasm	Psychoanalysis
Faith Cure	Suggestion
Hypnotism	Superstition
Magic	Telepathy
Medium	Trance
Mesmerism	Witchcraft
Mind Reading	

SPIRIT WRESTLERS. See DUKHOBORS.

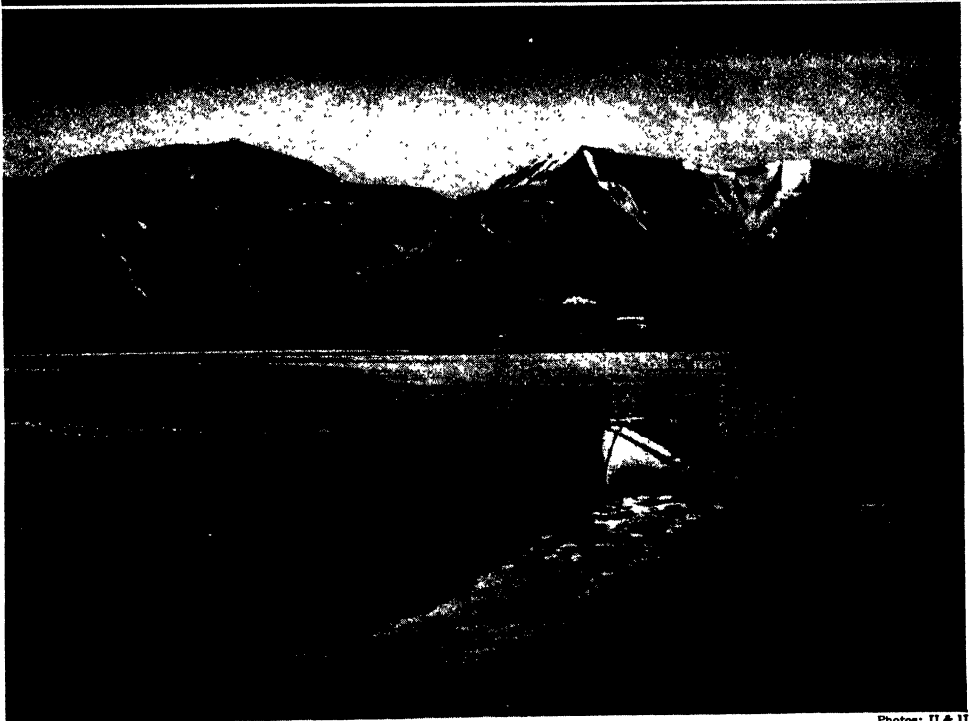
SPIROCHAETES, *spi ro ke' tez*. See MEDICINE AND DRUGS (Medicines Dug Out of the Earth).

SPIROMETER, *spi rom' e tur*, a device for measuring the capacity of the human lungs; that is, the amount of air which can be expelled after a deep breath is taken. A spirometer in common use consists of two cylinders, the upper one so made as to move freely up and down when placed inverted within the other. To the upper cylinder are fastened a tube and an air cock, and the lower is filled with water. When the person under examination breathes into the tube, the air is collected in the inverted cylinder and it rises in the water, the number of inches it moves being recorded on a graduated scale. From this record is computed the number of cubic inches of air expelled. The spirometer is used in testing the lung capacity of candidates for the army and navy, applicants for athletic membership, and so on.

SPITSBERGEN, *spits' bur gen*, an Arctic archipelago, a province of Norway since 1925, consists of five large islands and many smaller ones, with an estimated area of 25,000 square miles. The official name adopted by Norway is Svalbard, "The Cold Coast."

Spitsbergen was in all probability discovered by Norwegians in 1194, and rediscovered in 1596 by Barents and Heemskerck, Dutch navigators.

In 1607 Henry Hudson visited the islands. In the seventeenth century, a profitable whaling industry was established, and this resulted in dispute between England, Norway, and the Dutch nation over sovereignty. Within a hundred years, whaling declined, and the question of ownership again was of no importance until after 1900, when rich coal fields were discovered. By 1927 the coal exported



Photos: U & U

Bleak and Lonely Spitsbergen. Above, a spot 800 miles from the North Pole, where, during May, June, July, and August, the sun does not disappear below the horizon; there are four months of continuous daylight. Below, Advent Bay, an infrequent port of call.

amounted to more than 300,000 tons. The nationality of the islands was settled definitely by a treaty signed in 1920 at Paris, in which Norway's sovereignty was recognized by all the powers, although ratifications were delayed by Soviet Russia, and the treaty was not effective until August, 1925.

Spitsbergen is the most northerly land in the world on which people can live, but is not accessible, for it is not in the lines of travel, and there would be no profit in attempts to establish routes and plant colonies. The six mining camps, of which Longyearbyen, with less than 550 population, is the largest, are inhabited the year around. However, the islands have a slightly higher winter temperature than that at Leningrad, the lowest temperatures rarely reaching -30° . Winter sets in early in September, and for four months the sun is continuously below the horizon, although for three or four hours of each twenty-four, the darkness is relieved by faint twilight.

There is not a tree on any of the islands, but botanists report that 130 varieties of flowers and plants grow during the short Arctic summer. Winter population, about 1,200.

SPITZ, OR POMERANIAN, DOG, a small dog having a foxlike face and sharp-pointed muzzle. The toy varieties of this dog average about eight pounds in weight. The ears are erect, and the bushy tail is usually carried over the back. Its coat, beautifully soft and silky, may range in color from black through gray and red-brown to white; the pure, or white, dogs, the latter with a black-tipped nose, are considered the most desirable. In its native land, Pomerania in Prussia, the Spitz is used to tend sheep, but in America its only value is as a pet or fancy breed. See DOG. M.J.H.



THE SPITZ, OR POMERANIAN

The above is a photograph of a prize-winner in the toy-dog class.

SPLEEN, the largest gland of the body not having a discharging tube. It lies below the diaphragm, to the left and a little back from the stomach (see GLANDS). In adults the spleen is about five inches long and three or four inches wide, and it weighs about seven ounces; it is soft and spongy, crumbles easily, and is a deep violet-red in color. The organ is a mass of cellular tissue covered by a fold of serous membrane from the peritoneum, or membrane that lines the abdominal cavity,

which passes over it from the diaphragm, holding it in place.

The function of the spleen is not definitely known. It may be completely removed from the body without any demonstrable ill effects. This procedure is, in fact, often very important in relieving discomfort from diseases which center in the spleen. The fact that one may survive its removal would seem to indicate that the function of the spleen must be purely accessory. Before birth there is evidence that some of the red blood cells are formed by the spleen. This function seems to cease after birth, and the organ seems to be concerned in some way with the destruction, rather than the formation, of red cells.

The spleen belongs to the lymphoid system of the body. K.A.E.

SPLENIC, *splen' ik*, **FEVER**. See ANTHRAX.

SPLICING, the process of joining two rope ends without tying, by interweaving the loosened strands, which, in turn, are composed of yarns or fibers twisted together.

The three kinds of splices in general use are known as the *short*, *long*, and *eye* splices. The short splice (Fig. 2) is made by placing the rope ends together in such a manner that each strand lies between corresponding strands in

the second piece. The weaving of the first two is easy, but the placing of the third is more difficult; the rule is to "go over one and then under one." A long splice is not a long-woven short splice, but is made by raveling the strands back two or more feet, and then, after placing the ends together as in the short splice, continuing to displace one strand by laying the other in its place. Near the end of the strand, the two are tapered, tied, and the loose ends interwoven in the body of the rope.

If the rope is bent back and the end spliced into its own body, there is formed an eye or ring (Fig. 3). The method of lacing is the same as that used in making a short splice. To avoid friction that would soon wear out a rope that must bear a heavy weight, an iron thimble is often inserted in the eye splice.

The three loose strands may themselves be intertwined in such a manner that a symmetrical knot is made at the end of the rope; this is called a *single wall knot*. There are few

other methods of stopping a rope that are as practical (see Fig. 4 in the illustration).

A rope end may be bent back to form a ring or hook called a *bight*, and a second rope tied or laced in, as in Fig. 1. This is called a *becket hitch*. See **KNOTS**.

SPLIT INFINITIVE. See **INFINITIVE**.

SPOILS SYSTEM, in politics, a system by which officeholders of all degrees of importance are dismissed after their party has been defeated in an election, to make places for new appointees of the successful party. Great party leaders, with endless patronage at their command, have since ancient times rewarded their followers by giving them offices. The only way to find enough places to supply the office-hungry partisans of a new administration is to turn out the holders, even though they are experienced and efficient.

In the United States, the system found its greatest exponent in Andrew Jackson, whose friend, William L. Marcy, gave the system its name when he declared that "to the victor belong the spoils of the enemy," in politics as in war. Since the days of Jackson and Marcy, however, a feeling has arisen, not only in the United States, but in Canada, England, and other countries, that governments are operated not for the financial profit of a few political leaders and their officeholding friends, but for the benefit of the people. This spirit has slowly developed a new method of appointment to many of the offices in the governments of to-day; this is described in the article **CIVIL SERVICE** (Civil Service Reform). See, also, **JACKSON, ANDREW** (His Administration).

SPOKANE, *spo kan'*, WASH., the county seat of Spokane County and the second largest city of the state, ranking next to Seattle. It is situated in the eastern part of the state, sixteen miles west of the Idaho state line, 330 miles east of Seattle, and 368 miles northeast of Portland. The Spokane River flows through the city from east to west, in a series of cascades, not only adding to the scenic beauty, but providing immense power for manufacturing purposes. Population, 1928, 109,100 (Federal estimate).

General Description. Spokane is situated 1,891 feet above the sea, and within a short motoring distance of the city are seventy-six lakes, including Chelan, Coeur d'Alene, and

Spirit, all renowned for their beauty. Spokane is a well-built modern city, with beautiful homes in its residential districts, and a business section of high architectural type. The manufacturing and packing industries are in a factory district set apart from the main business and residential sections.

The largest of the city's forty-three parks, which have a total area of 2,200 acres, include Manito, with its beautiful sunken gardens, Natatorium, Cliff, Minnehaha, Hays, Mission, Audubon, and Corbin. The High Drive Parkway, on the east bank of Latah Creek, overlooks the city and the Spokane Valley. The Appleway, on the east side of the city, is a remarkable area of intensively cultivated orchards and gardens. Charming homes are also scattered thickly throughout this territory.

Transportation. Spokane is the most important railway center of the Pacific Northwest, having the service of six trunk-line railroads—the Northern Pacific, the Chicago, Milwaukee, Saint Paul & Pacific, the Great Northern, the Union Pacific, the Spokane International, and the Spokane, Portland & Seattle. Many branch lines and interurban and motorbus lines also center here. The city has a municipal airport.

Industry and Commerce. Spokane and the territory it serves have become known as "the Hub of the Inland Empire"—that great stretch of country which embraces 150,000 square miles in Eastern Washington, Northern Idaho, Northeastern Oregon, and Western Montana. Crop production, dairying, and poultry-raising are the chief basic industries, and the famous Northwest apples are sold in all the markets of the world. Large yields of small fruits are also produced. The city is an important livestock center, and the great area of pine forest supplies material for sawmill products, paper, and furniture. One of the leading factors in the city's prosperity is the vast water power afforded by the Spokane River. The famous Coeur d'Alene silver mines and the Chewelah magnesite quarries and reduction plant are also operated by Spokane power. As the city is situated advantageously to the various Pacific ports, it is the point from which large amounts of lumber, wheat, fruit, silver, lead, and other raw products of the Pacific Northwest are shipped. It is a port of entry.

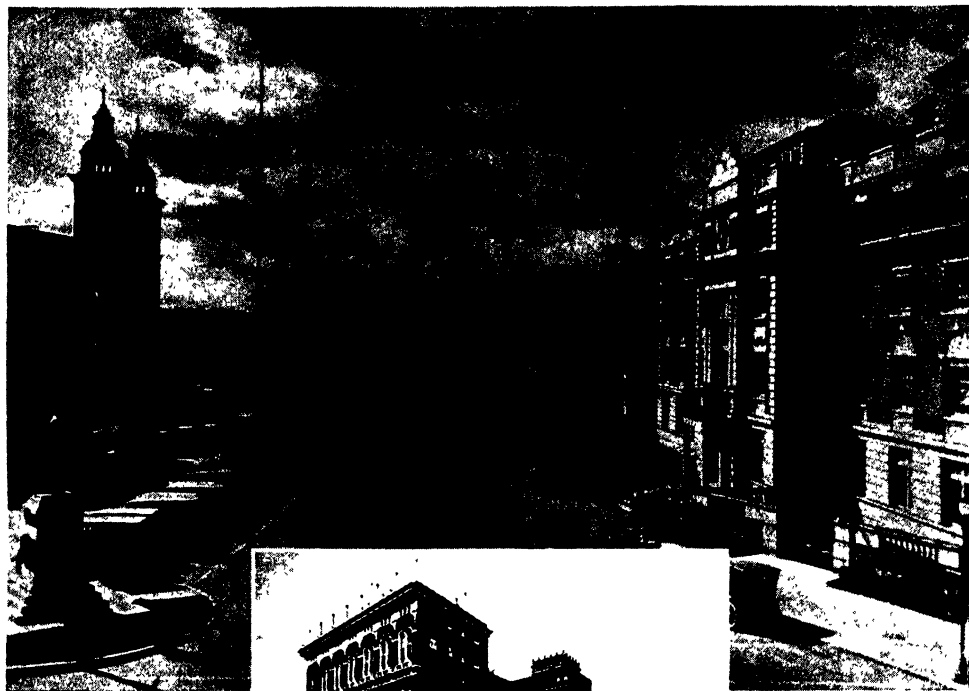
Institutions. Educational institutions include Gonzaga University, Spokane College, Spokane University, Academy of the Holy Name, Saint Joseph's School for boys, Saint Augustine's School, and Whitworth College. Other institutions include the Grace Campbell Memorial Art Association, an orphanage, hospitals, and homes for the dependent.

History. The first settlement was made in 1874 by James N. Glover, and was originally called Spokane Falls; the name is of Indian origin, meaning *children of the sun*; hence the city is locally referred to as "Sunny Old Spokane." It became the county seat in 1882, and the present name was adopted in 1890. The Northern Pacific Railroad constructed its line to this point in 1883, thus greatly aiding in the development of the great natural resources of the region. In August, 1889, the business section of the city was destroyed by



SPLICING

- (1) A rope end bent to form a ring, and a second rope tied or laced in; (2) short splice; (3) eye splice; (4) wall knot.



fire, but was soon rebuilt. The commission form of government was adopted by Spokane in 1910. W.G.O.

SPOILIATION. See **CONTRACT.**

SPONDEE. See **METER.**

SPONGE, *spunj*, the common name of a group of sea animals forming the lowest branch of living things composed of many cells. Their scientific name is *Porifera* (which see). The skeleton of one species gives the world its commercial sponges. People used to consider it a plant, perhaps because it cannot swim, but grows attached to shells, rocks, wharves, or the sea bottom. It is curious to note that, when it roots in mud, it develops a stem in order to keep from being smothered. Living sponges are brilliantly colored, different varieties showing various shades of red, yellow, purple, blue, and green, as well as brown and gray. While they are found in practically every zone, they develop best in tropical or the warmer temperate regions. They make their homes at all depths—close to shore and as many fathoms deep as the ocean has been explored by man—and have existed for many ages; their fossils occur in very old rock.



Chamber of Commerce; Visual Education Service

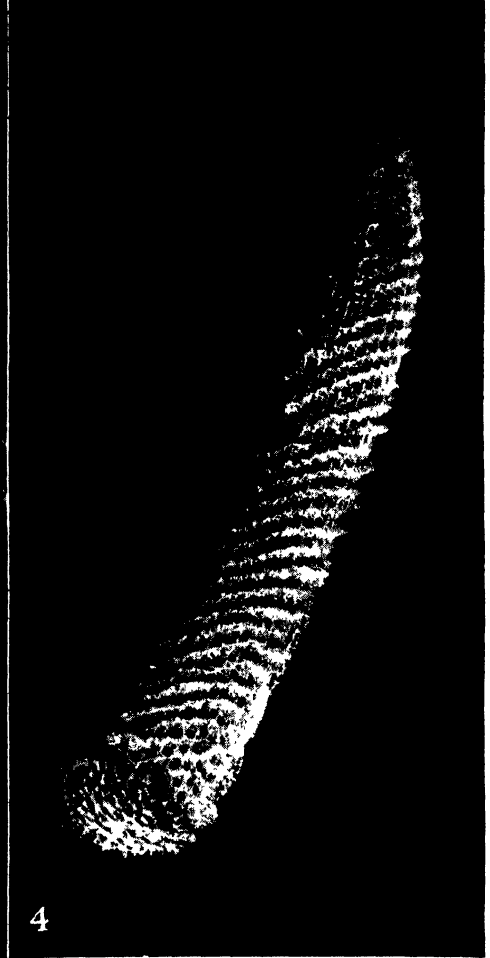
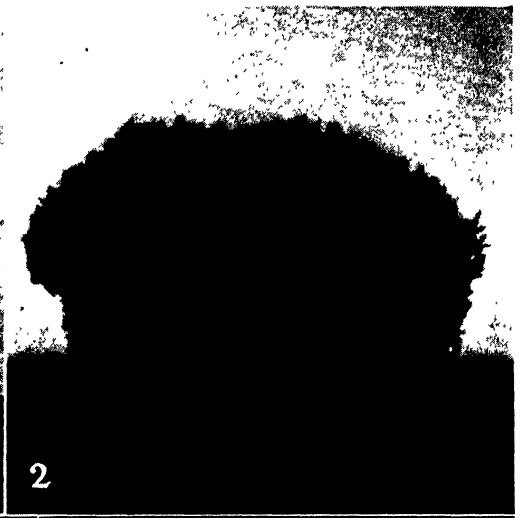
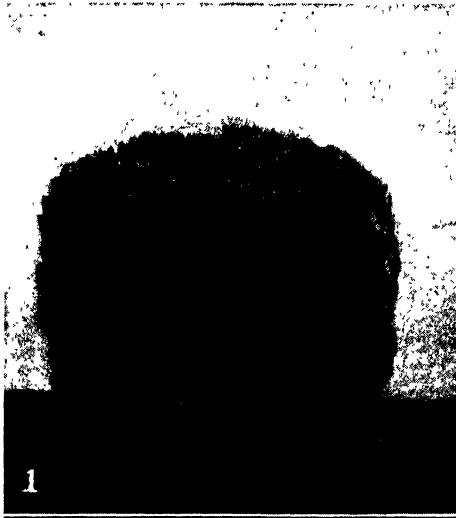
IN THE CITY OF SPOKANE

The upper illustration is that of the civic center. Below is a modern hotel in the business section of the city.

Structure. The sponge is just one step higher than the simplest form of animal life, the single cell. Beginning with a tiny egg, it develops into a soft mass of slimy flesh made up of many individual cells, all formed through the continued division of the original cell. Certain of the cells give rise to skeletal rods of many different

shapes, composed of different material in different kinds of sponges. On the outer surface of the sponge body are countless pores. From this fact the subkingdom derives its special name of *Porifera*—meaning, literally, *bearing pores*. Through these countless minute openings, the sea water streams in at all points, and is carried into every part of the sponge's body by a network of canals, or tubes. If we cut through an ordinary bath sponge, these branching canals can be seen in the skeleton.

In the inner membrane, along the canals, are groups of cells provided with little lashes called *flagella*, which, by their constant waving to and fro, keep the water circulating. Thus the sponge is equipped with a perfect "irrigation system," by means of which the animal gets



Photos: Visual Education Service

Four of the Sponges. (1) Velvet, from Florida. (2) Sheepswool, also a Florida product. (3) Glass rope, from the Indian Ocean. (4) Venus's flower basket, from the Indian Ocean.

the food and air necessary for life; for the water brings oxygen, together with bits of plants and tiny living organisms. The sponge has no general stomach to digest this food; instead, each cell selects from the current whatever it needs. As the water flows out through the large outer openings, it carries away all waste matter and surplus food.

Sponges take many different shapes. The form depends to a large degree upon the neighborhood in which they grow, for their soft tissue is, of course, very yielding. In shallow water, where there is more or less disturbance, they are usually irregular; those which grow in deep, quiet water are, as a rule, beautifully symmetrical and often very wonderful. Some sponges are thin and flat; some grow like low bushes with widespreading branches; some look like fans; others resemble cups, vases, or slender cylinders. In height they range from the merest fraction of an inch to over three feet.

The Skeleton.

On account of the jellylike substance of which the cells are composed, a skeleton is very necessary to support and protect the animal. In some species the skeleton looks like lime or white marble; in others it is flinty or glassy in appearance. The exquisite, lacy *Venus's flower basket*, which used to be credited to skilled Chinese or Japanese craftsmen, is nothing but the framework of a dead *glass sponge*. These lime and flint skeletons are composed of myriads of tiny bodies called *spicules*, made of a substance secreted by some of the cells. In

the form of delicate threads, slender needles, or oddly shaped crystals resembling snow crystals, these spicules intertwine to make the solid mesh of the skeleton. Sometimes they push through the tissue and cluster around the mouths of the canals, thus barring out dangerous intruders.

Another protective feature of the sponge is its very disagreeable odor, suggesting garlic—a highly effective weapon for keeping at a distance fish and other creatures that might feed on it.

Besides the limy and glassy skeletons, there is a third class, characterized by elastic, horny fibers resembling silk; and it is this variety that provides the absorbent bath sponge.

The Sponge of Commerce. Sponges are gathered for trade purposes in various ways. In some localities, especially the Mediterranean Sea, where they grow in very deep water, they are collected by divers. In other places, dredging is resorted to. The fisheries off the reefs of Florida use the harpoon method. Sponge-fishing crews go out in large vessels for many weeks at a time. The men are sent out from

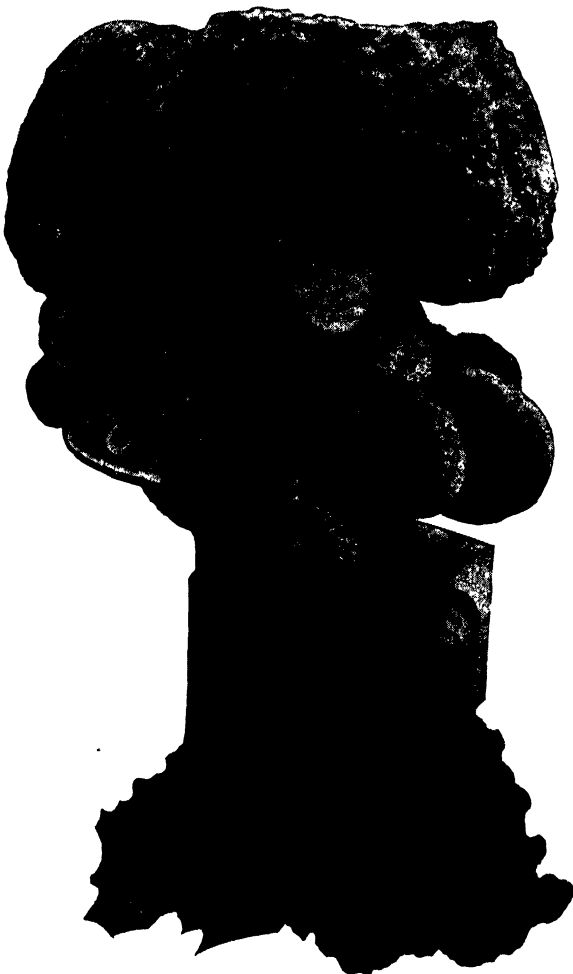


Photo: Wide World

NOT A GOOD HEADPIECE FOR A RAINY DAY

The sponge on the boy's head is the largest ever taken from the fishing grounds at Key West, Fla. Surrounding him and at his feet are several Florida varieties.

the ships in pairs, one to manage their row-boat and the other to do the actual fishing. By means of a glass-bottomed bucket, the latter can see to a depth of sixty or more feet; and when he discovers a sponge of fair size, he lets down his long forked pole and dextrously spears it. The sponges are spread about the deck or buried in sand until the flesh decomposes, and are then thrown into small pens filled with water, called *kraals*. From time to



Photo: Keystone

A Floating Sponge Market. A vessel in Key West harbor, just returned from a successful trip, laden with sponges. The owners are waiting for purchasers.

6775



Photo: Visual Education Service

SPONGE FLEET AND WHARF AT TAMPA, FLORIDA

time, they are beaten to dislodge the decayed substance, and when thoroughly clean are strung and hung up to dry, after which they are ready for the market. Sometimes they are bleached, but this makes them less durable.

The finest, softest sponges come from the Mediterranean, particularly from the neighborhood of Turkey; the next best grade is the Red Sea product. These foreign sponges are now scarce and command high prices. Nearly all the sponges used in the United States come from the fisheries of Florida and the Bahama Islands. The best grades of Florida sponges are called *sheep's wool*. Cheaper grades are the ordinary *yellow sponge* and the very coarse *grass sponge*. Although the Mediterranean fisheries produce a far smaller quantity, the value of their output is considerably greater, on account of its superior quality. The weather has much to do with the size of the yield.

In recent years, scientists have been experimenting with artificial production, since many of the richest sponge beds are now all but exhausted. The most promising method appears to be that of cutting up those sponges which

are too small or irregular to be salable, and stimulating growth from these pieces, which are called *plants*. The United States government



Photos: Visual Education Service

GROWING SPONGES

has passed legislation to protect the Florida sponge fisheries from improper fishing methods.

Fresh-Water Sponge. Although the sponge is properly a marine animal, a certain branch of the family has adapted itself to fresh water.

It is to be found in ponds, rivers, and lakes in nearly all parts of the world, particularly where the water is quiet. One must look very closely to find these sponges, for they are only from half an inch to an inch long. They have the same porous, cellular bodies and supporting skeletons as their sea-born relatives, and the same habit of clinging to stones, leaves, and other objects. However, they cannot boast the same vivid coloring or curious forms; they are green or grayish, and grow either in flat masses or—in spots where the water is very still—as miniature bushes.

The principal difference between the marine and the fresh-water sponge is that in the latter there is provision for carrying the eggs over through the cold weather. Toward the end of the year, there form within the grown sponge what are called winter buds—minute cells or eggs encased in a thick membrane, which fall to the bottom. They remain dormant until spring, and then multiply by cell division.

These fresh-water sponges are within every one's reach, and it is interesting to collect specimens in late summer, when they are fully developed, and preserve them in diluted alcohol. By studying them through even an ordinary microscope, one can learn a great deal about this group of sponges. S.H.S.

Scientific Names. The scientific name of Venus's flower basket is *Euplectella aspergillum*; that of a very common bath sponge is *Euspongia officinalis*. Fresh-water sponges belong to the genus *Spongilla*.

SPONTANEOUS COMBUSTION. See COMBUSTION, subhead.

SPONTANEOUS GENERATION, OR ABIOTOGENESIS, *ab ih o jen' e sis*, the theory that certain lower forms of life have come into existence out of non-living matter. In the seventeenth century, many people believed that worms were generated spontaneously in cheese and timber, mice in mud, and maggots in the juices of decaying meat. In 1668 an Italian biologist named Redi showed that no maggots were bred in meat when flies, kept away by wire netting, were prevented from laying eggs in it. This experiment discredited the whole theory, but, in the eighteenth century, spontaneous generation was revived to account for the origin of the countless bacteria and protozoans made known to science through the improvement of the microscope. Not until the middle of the nineteenth century, after a series of investigations culminating in the experiments of Pasteur, was the theory of spontaneous generation of microorganisms wholly abandoned.

Since then, scientists have held to the doctrine of "all life from preceding life," though they limit this concept to the field of actual observation and experiment. Biologists think it probable that the first forms of life developed

by chemical processes out of non-living matter under special conditions prevailing in early geologic time. Some authorities believe that "starts of life" may be taking place to-day, but such developments, if actually occurring, have never been observed in nature, and possibly cannot be. R.H.

Related Subjects. The reader is referred in these volumes to the following articles:

Bacteria and	Fermentation
Bacteriology	Geology
Biology	Pasteur, Louis
Evolution	Protoplasm

SPOONBILL, a wading bird, similar to the ibis, distinguished by its odd, spoon-shaped bill, which it swings from side to side in the water in search of shellfish, marine insects, and small crabs. The most beautiful species is the *roseate spoonbill*, native to the warmer regions of the Americas, though in Florida, where it was formerly abundant, it has been exterminated by plume-hunters. The neck and the upper back of this bird are white, and the rest of the plumage is a rosy pink, becoming carmine on the wing coverts. It nests in colonies, returning year after year to the same locality. The nest is a platform of sticks, placed in low trees or shrubs. The eggs are five to seven in number, spotted and blotched with olive-brown. D.L.

Scientific Name. The spoonbills belong to the family *Plataleidae*. The roseate spoonbill is *Ajaja ajaja*.

SPOONBILL CAT. See PADDLEFISH.

SPOON RIVER. See ILLINOIS (Physical Features).

SPORE, a minute body borne by lower plants, such as algae, ferns, mosses, and lichens, which has the same function as a seed in higher plants—that of reproduction. Spore-producing plants, which are known as *cryptogams*, are of two kinds, those containing green coloring matter used in the manufacture of plant food (see CHLOROPHYLL), and those which must draw nourishment from other plants, or have other sources of organic matter. It is the latter—the organisms causing smut on corn, cotton wilt, wheat rust, apple blight, and the like—that are of special concern to the agriculturist, though there are numerous plants of this class that are harmless. A typical spore is a single living cell; that is, a mass of protoplasm with differentiated nucleus and often with characteristic cell wall, and containing food materials. It germinates or develops in a fashion determined by the heredity of its kind and, to a certain extent, by the conditions surrounding it. See CRYPTOGAMS. B.M.D.

SPORT, in science. See EVOLUTION (The Factors of Evolution).

SPOTTED ALDER. See WITCH-HAZEL.

SPOTTED FEVER. See TYPHUS FEVER.

SPOTTISWOOD, LADY JOHN SCOTT, the composer of the music to *Annie Laurie* (which see).

SPOTTSYLVANIA, *spot sil va' nih ah*, COURT HOUSE, BATTLE OF. See WAR OF SECESSION.

SPRAIN, a form of joint injury in which the tough, fibrous bands, or ligaments, which hold the joint in place, are torn in part or in whole. A minor sprain, involving stretching but not laceration, is sometimes called a *strain*, but these terms are commonly used interchangeably. Sprains may occur at any joint, but are most frequent at the ankle, owing to its bearing the weight of the body. Torn ligaments must be supported until they have healed. This was formerly accomplished by putting on a plaster cast, thus making it impossible to move the joint. When the elbow or shoulder joint is injured, an arm sling is used.

Quick Recoveries from Sprains. Any person who is interested in quick recovery after a bad sprain will do well to read an account of how the badly sprained joints of athletes are treated at the University of Pennsylvania. The men who play in major competition, for instance football, must not stay out of the game long. Therefore it was up to Dr. A. B. Light, who looks after their physical condition, to work out a method of quick, and at the same time effective, cure.

The sprained joint is very tightly wrapped in a very firm bandage. This bandage is wrapped almost tight enough to cause pain. It is put on at once. The next step is the application of cold wet cloths. It is better not to use ice; 65° to 68° is the temperature at which the capillaries are most constricted, and that is the objective. Chilling below that degree of cold causes the capillaries to dilate. To put the sprained joint in hot water does cause temporary ease, but it also causes the capillaries to dilate, and that is harmful.

The joint is kept elevated for two hours while this tight bandage is on and cold cloths are being applied. At the end of two hours, very tight bandages are applied, but not so tightly as before; they are snug and firm, but not painful. The joint is kept elevated for twenty-four hours. At the end of this twenty-four hours, the bandages are removed, a gentle massage is given, and X-ray pictures are taken to discover whether there are any fractures. If there are none, the snug bandages are re-applied and the man uses the joint a little. At the end of this short period of use, the joint is again elevated and left quiet for another day. This treatment is continued until the third day.

On the third day, the bandages are removed and heat is applied to the joint while it is elevated. This is continued for one-half hour. A more vigorous massage is given. The joint

is used for a short time. The bandage is re-applied. On the fourth day, this treatment is repeated. On the fifth day, the subject is made to exercise the joint much more. If it is the ankle joint, he is asked to run a short distance. Then a Bibboney supporting boot is put on that foot, and the man is told to use the joint rather freely. At the end of one week, all strappings are removed. For some time the athlete should strap this joint just before entering a contest.

The principle of this Light method of treating sprained joints is that most of the pain and swelling comes from hemorrhage into the tissues around the joint. This treatment aims to prevent hemorrhage and oozing. See FIRST AID TO THE INJURED. W.A.E.

SPRAT, a sea fish, one of the smallest species of the herring family, growing only about six inches long. It is often taken for young herring, but can be distinguished from the latter by the sharply notched edge on the abdomen. Sprats live in shoals along the European Atlantic and Mediterranean coasts. They are caught in immense numbers with bag nets or seines, and make a cheap, wholesome food, being eaten fresh, smoked, or pickled in brine. The European sprat is *Harengula sprattus*. L.H.

SPREADEAGLEISM, *spreɪd e' g'l iz'm*. See JINGO.

SPRING. During a rainstorm, a part of the water soaks into the ground and filters downward until it reaches a layer of rock or clay, through which it cannot pass. This layer may come to the surface farther down the slope,



THE ORIGIN OF A SPRING

and if the water finds a channel along which it can flow, it comes to the surface as a spring. Springs are most numerous in mountainous and hilly regions. Sometimes they flow from crevices in the rock high up on the side of a cliff, but they are more frequently found at or near the foot of a cliff or some other slope.

Notable Springs. From the walls of the Snake River Canyon in Idaho, leap a thousand springs forming veils of silver lace upon the grim walls of black lava. These springs, which enhance forty miles of the canyon, could furnish 120 gallons of water a day for every person in

all the cities of the United States of over 100,000 inhabitants. While not available for that purpose, some, at least, of the "white horses" have been harnessed for power.

The largest limestone spring in America is Silver Spring, Fla., which has a maximum flow of 822 cubic feet a second. Blue Spring, in the same county, is the second largest.

According to the United States Geological Survey, there are nine states having springs of the first magnitude; that is, having an average discharge of 65,000,000 gallons of water a day, or enough to supply a city of 500,000 inhabitants.

Hot and Cold Springs. The temperature of springs is nearly the same as that of the underground rock over which the water flows. Cool springs have deep sources, whose temperature is not affected by climatic changes, and which varies but little throughout the year. On the other hand, a spring whose source is near the surface will be much warmer in summer than in winter. In volcanic regions, the water may come in contact with hot layers of rock, and when this occurs, a hot, or thermal, spring is found.

Mineral Springs. Water, in filtering through the ground, dissolves carbonate of lime and various other minerals. Springs whose waters contain these substances in solution are known as *mineral springs*. Various gases, such as carbon dioxide, sulphureted hydrogen, and nitrogen, are also found in the water of these springs. Some mineral springs have become noted health resorts because of the curative properties of their waters. Saratoga Springs and Sharon Springs, N. Y., Mount Clemens, Mich., the springs at Carlsbad, Czechoslovakia, and the hot springs at Hot Springs National Park, Ark., and at Thermopolis, Wyo., are good examples of such springs. R.H.W.

SPRING, the quality of a material by virtue of which it can "spring back," or resume a position from which it has been forced; or that quality of a material which causes it to rebound to its original position, after some force which has disturbed it is released. It is a characteristic of such materials as steel wire or rods, rubber, whalebone, and wood. The term *spring* is also applied to various devices and mechanisms.

In carriages, automobiles, and other vehicles, springs are used between the axles and the body of the vehicle to decrease concussion. In watches and clocks, they are used to produce motion, being wound rather tightly around a central post, then gradually unwinding and imparting motion to the mechanism. Springs may return to their natural position slowly, as in the case of the mainspring of a watch, or quickly, as in a gun or rifle, in which the spring is suddenly released from high tension, setting in motion the hammer, or pin, which explodes

the charge. The quick action of a spring also occurs when a bow is bent and the cord is released. In the familiar spring-balance scales used in stores, the spring causes an indicator to move according to the tension. The weight of the article on the scale is ascertained, and when this is removed, the spring resumes its normal position. See ELASTICITY. A.L.F.

SPRING. See SEASONS.

SPRING BALANCE. See BALANCE.

SPRINGBOK, OR SPRINGBUCK, a species of South African antelope, the nearest ally of the true gazelles, so named from its habit of springing upward, sometimes as high as twelve



THE SPRINGBOK

feet, when alarmed or at play. Among the Dutch settlers, it is known as *trekbock*, or *traveling buck*. Large herds, because of drought and loss of more secluded pasture, migrate into more fertile regions, clearing the plains of grass and annoying the herdsmen of those districts. The springbok is exceedingly graceful, and is the most slenderly built of all antelopes. Its coat is close and short, of a dull-brown color, with a white stripe extending from the middle of the back to the tail. The horns curve in the shape of a lyre, and in the female are not so deeply ringed as in the male. The skin is valuable. When in good condition, the flesh is excellent for food. See ANTELOPE. W.N.H.

Scientific Name. The springbok belongs to the family *Bovidae*. Its scientific name is *Antidorcas euchores*.

SPRINGER. See ARCH.

SPRINGFIELD, the name of a rifle (which see).

SPRINGFIELD, ILL., the capital of the state and the county seat of Sangamon County, is located in the central part of the state, on the Sangamon River, 185 miles southwest of Chicago and ninety-nine miles northeast of Saint Louis. The city is the center of a productive agricultural region, and lies in one of

the important bituminous coal fields of the state. Its chief historic fame rests upon the fact that for many years it was the home of Abraham Lincoln; and here is the tomb of the "Great Emancipator," as well as his former home, now owned and maintained by the state. Population, 1928, 67,200 (Federal estimate).

Springfield covers an area of over nine square miles. It has an excellent park and boulevard system. The principal parks, which cover 600 acres, include Lincoln, Washington, Douglas, Reservoir, Bunn, and Bergen. In Oak Ridge Cemetery, adjacent to the city, is the Lincoln National Monument. The lower part is a mausoleum containing the remains of Abraham Lincoln and members of his family. In the center rises a shaft 121 feet high. At its base, in front, is a statue of Lincoln, and at the four corners are groups of statuary symbolizing the cavalry, navy, artillery, and infantry of the United States. This monument, which cost about \$350,000, contributed by people from every part of the United States, was designed by the sculptor Larkin G. Meade, and was dedicated in 1874.

Transportation. The railroads serving the city are the Baltimore & Ohio, the Chicago & Alton, the Chicago, Springfield & Saint Louis, the Chicago & Illinois Midland, the Illinois Central, and the Wabash. There are also numerous electric and motorbus lines.

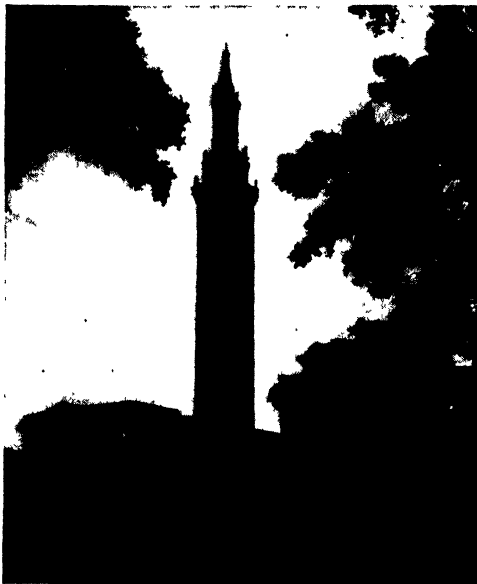
Industries. In addition to large coal-mining interests and large brick plants, Springfield has a great watch factory and manufactories of flour and allied products, furniture, lumber, textiles, clothing, shoes, castings, garage equipment, electric meters, radio sets, tile, miners' supplies, stucco, and automobile accessories.

Institutions and Buildings. The chief public building is the state capitol, built in the form of a Greek cross, with a dome 361 feet high. The cornerstone of the building was laid in 1868, and it was first occupied in 1876. Other state buildings include the Supreme Court, State Arsenal, and Illinois Centennial Memorial Building, erected (1918-1922) as a memorial of the 100th anniversary of Illinois as a state of the Union. In this building is also housed the Museum of Illinois. The leading institutions are a college of music, a law school, and a Lutheran college, three sanitariums, and homes for the aged and for children. The city is the seat of the Illinois supreme court and a United States district court.

History. Springfield was first settled in 1818, and the place was selected as the county seat of the newly created Sangamon County. It was incorporated as a town in 1832, and in 1840 was chartered as a city. In 1837 Springfield was made the capital of the state, and the legislature first met here in December, 1839. The Illinois State Fair Grounds, containing 376 acres, were permanently located in Springfield in 1894. The city has the commission form of government. It is the birthplace of the poet Nicholas Vachel Lindsay. A.M.K.

SPRINGFIELD, MASS., a port of entry and the county seat of Hampden County, is situated in the southwestern part of the state, in the beautiful valley of the Connecticut River, ninety-nine miles southwest of Boston, 105 miles southeast of Albany, and 150 miles northeast of New York City. Springfield is one of the most attractive cities of New England, and has varied and extensive industries. Population, 1928, 140,800 (Federal estimate).

General Description. Springfield occupies a site of great natural beauty on the east bank of the Connecticut River, about six miles from the Connecticut state line. Adjacent to the



CIVIC CENTER OF SPRINGFIELD, MASS.

city, and forming a part of its larger or metropolitan area, are the cities and towns of Chicopee, Ludlow, Longmeadow, Agawam, and West Springfield. The handsome concrete Memorial Bridge, dedicated in 1922, is one of the interesting features of the city. This bridge spans the Connecticut River, and was built to commemorate the patriotic service of the citizens of Hampden County.

The park system of Springfield constitutes a total of 550 acres. Forest Park, the largest, contains one of the finest collections of lotus plants and aquatic flora to be found anywhere in America. At the southern entrance to this park is a monument to William McKinley, by Martiny. Merrick Park contains Saint Gaudens' famous statue *The Puritan* (see PURITANS, for illustration), and in the northern part of the city stands a monument in honor of the soldiers of the Spanish-American War. The streets are wide and tree-lined, and there are many handsome residences.

Transportation. Springfield is the center of transportation lines, both rail and motor, for Western New England. The city is served by the Boston & Albany, the Boston & Maine, and the New York, New Haven & Hartford railroads. The electric-car service is supplemented by motorbus lines.

Industries. As a manufacturing and retailing center, Springfield occupies a prominent position. Among the principal manufactures are firearms, cutlery, bicycles and motorcycles, railroad cars and supplies, electrical machinery, foundry and machine-shop products, confectionery, cotton and knit goods, brass and bronze goods, and meat-packing products. The printing and publishing industry is likewise important; *Webster's International Dictionary* is published here. The city is also an insurance center.

Institutions and Buildings. The educational institutions include Springfield College, the training school of the International Young Men's Christian Association, the American International College, working among immigrant races, and the McDuffie and the Elms, both schools for girls. In the city are a government arsenal and an armory. The arsenal was established by the Continental Congress during the Revolutionary War, and the armory, established in 1794, makes a large part of the small arms used by the soldiers of the United States. Other noteworthy structures are the Art Museum, the Horace Smith Hall of Sculpture, the Museum of Natural History, the Union Railroad Station, opened in 1926, and an impressive group of municipal buildings.

History. Springfield was founded in 1636 by William Pynchon, who led a company of settlers there from Roxbury. The place was known as Agawam, after the Agawam Indians, until 1640, when the name was changed to Springfield, after the native place of Pynchon. During King Philip's War, the settlement was burned by Indians, and was the center of disturbance during Shays' Rebellion (which see). Springfield was chartered as a city in 1852. For many years the city was the home of J. G. Holland, who is buried here, his grave being marked by a medallion made by Saint Gaudens. There is a city-planning commission which supervises the development of the city. A.L.P.

SPRINGFIELD, Mo., an important manufacturing city and the county seat of Greene County, is attractively situated upon a plateau in the heart of the Ozark Mountains, in the southwestern part of the state, 200 miles southwest of Kansas City and 238 miles southwest of Saint Louis. Springfield is the gateway to the beautiful White River and the country made famous by Harold Bell Wright in his *Shepherd of the Hills*. Population, 1928, 51,700 (Federal estimate).

Springfield lies at an altitude of 1,345 feet, and is regularly laid out on an undulating site with handsome residential districts. The park system embraces 255 acres, Doling and Fasnigh being the largest among the ten municipally owned parks. The city is the commercial center for a large fruit-growing, farming, and lumbering district, and has important interests

connected with the mining and sale of lead and zinc.

Transportation. Railroads serving the city are the Saint Louis & San Francisco, the Missouri Pacific, and the Kansas City, Clinton & Springfield. There is a street-railway and auxiliary motorbus system. The Saint Louis & San Francisco Railroad main shops and general offices are maintained here. The city has a municipal airport.

Industries. The leading industrial establishments include flour and lumber mills, machine shops and iron works, wagon factories, and meat-packing plants. In the locality are productive lead and zinc mines. The city is an important poultry market.

Institutions. The leading educational institutions include the Southwest Missouri State Teachers' College, Drury College (coeducational), founded in 1873, and Loretto Academy. Near the city is the Academy of the Visitation, under the Sisters of Saint Chantal. The prominent public buildings include the Shrine Mosque, with a seating capacity of 6,000, a United States land office, and a state Pythian home.

History. Springfield was settled about 1830, incorporated as a town in 1838, and chartered as a city in 1847. It was one of the most important strategic points west of the Mississippi River at the beginning of the War of Secession, and was controlled in turn by Union and by Confederate forces. The commission form of government was adopted in 1916. C. OF C.

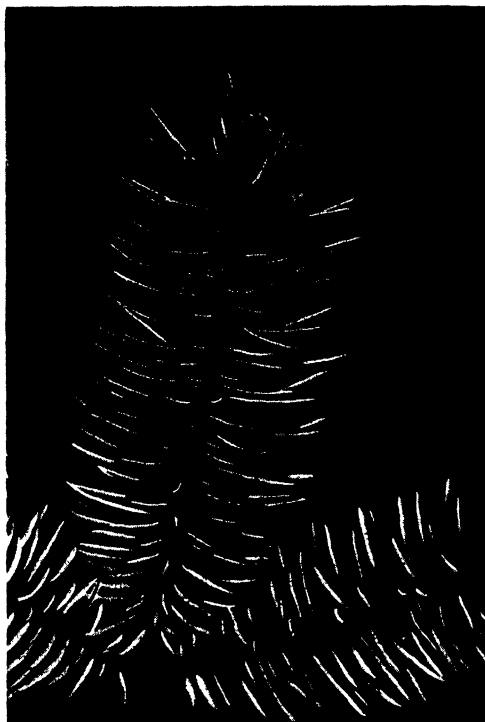
SPRINGFIELD, OHIO, the county seat of Clark County, is situated in the west-central part of the state, forty-three miles west of Columbus, the state capital. The city lies in the upper part of the Mad River Valley, at the junction of Lagonda Creek and the Mad River, and is on the National Old Trails Road, United States 40, which traverses the country from Washington, D. C., to Los Angeles. Springfield is in a productive farming region, and is one of the world's best-known cities for the production of rose plants. Population, 1928, 73,000 (Federal estimate).

The city occupies an area of over eleven square miles, the newer portion having spread over the higher and more undulating surface of the valley of Lagonda Creek. Numerous parks and playgrounds add to the attractiveness of the city.

Transportation. The Cleveland, Cincinnati, Chicago & Saint Louis, the Erie, the Detroit, Toledo & Ironton, and the Pennsylvania railroads serve the city, and there is also an extensive interurban and motorbus system.

Industries. Springfield's extensive industries depend upon the excellent hydroelectric power provided by Lagonda Creek and the Mad River. The chief manufactures include playground equipment, incubators, electric signs, metallic caskets, commercial thermometers, boiler-tube cleaners, musical instruments, and fractional horse-power motors. There are also extensive printing and publishing plants.

Institutions. The leading educational institution is Wittenberg College (Lutheran), founded in 1845. On the hills near the city are the Ohio state homes



Photos: St. Clair

THE SPRUCE TREE

At left, detail of the twigs, showing how the buds emerge from their ends. At right, the general appearance of the tree.

for the Masons, the Independent Order of Odd Fellows, and the Knights of Pythias. The city also has a home for crippled children, and the municipal and tuberculosis hospitals.

History. The first settlement was made in the vicinity in 1799, by Simon Kenton and a small party from Kentucky. This site, however, was later abandoned for the present one, on Lagonda Creek. When Clark County was erected, in 1818, Springfield was made the county seat, and in 1850 it was chartered as a city. The commission form of government was adopted in 1914.

A.T.A.

SPRING HILL COLLEGE. See ALABAMA (Education).

SPRINGING BEETLE. See CLICK BEETLE.

SPRUCE, the common name of a genus of evergreen trees belonging to the pine family. There are about thirty species, all native to the northern hemisphere. Their northern limit is beyond the Arctic Circle; their southern, the European Pyrenees, the Himalayas of Asia, and, in North America, North Carolina and Arizona. Of the cone-bearing trees, the firs are most closely related to the spruces, but the cones of firs stand erect, while those of spruces hang downward. Their needles, too, are dissimilar. Those of firs are arranged in flat

rows, while spruce needles grow thickly in spirals around the branches, pointing in all directions. The foliage of spruce is otherwise distinctive. The leaves are four-sided, or keeled, an inch or less in length, and they are joined to the twigs by woody projections that give the branch a rough, prickly feel when the needles have fallen. Spruce trees tend to grow



CONE OF WHITE SPRUCE

in pyramidal form, and in old trees the drooping lower branches brush the ground. Spruces are valuable lumber trees and yield various other products (see *Uses*, below).

Important Species. The *white*, *black*, and *red* spruces of the East and the *Sitka spruce* of the West are the most important commercial species of North America. The white and black spruces, named for the general tone of

bark and foliage, are the most widely distributed of the species. In general, they grow between Bering Strait, on the north, and Maine, New York, and Michigan, on the south, with the black spruce following the higher altitudes to Virginia. British Columbia and Montana mark the western limits of their range. The white spruce may reach a height of 150 feet; the black is somewhat smaller. The ill-smelling foliage of the white spruce helps to distinguish this tree from the black. The red spruce is found from Nova Scotia to North Carolina and Tennessee. It varies from a small shrub, in the far north, to a tree 100 feet tall, in New Hampshire and Pennsylvania.

On the Pacific coast, between Northern California and Alaska, the Sitka spruce grows to huge size, especially in the swamps of tide-water regions. Giant specimens over 300 feet high are not uncommon. This is the species that was utilized in airplane construction during the World War. In Europe the principal spruce is the *Norway*, a handsome tree planted in Eastern North America as an ornamental. The so-called *Douglas spruce*, or *Douglas fir*, of Washington, Oregon, and British Columbia, belongs to a different genus, but is related botanically to the spruces. In yield of timber it rivals the redwood, which it nearly equals in size (see SEQUOIA).

Uses. Sprucewood is extensively used for wood pulp in the paper-making industry. The timber is strong, light, and elastic, and admirably suited for masts and spars of ships, boxes, and sounding boards of musical instruments, especially pianos, violins, and guitars. The tall, straight logs of Sitka spruce make the best airplane frames, because the wood fibers are long and close together and the timber is free from knots. Combining endurance and elasticity, the wood can be made into machines that withstand heavy blows without being shattered. Sprucewood is also used for interior finishing. Resin, tannin, and turpentine are products of spruce bark, and beer is made from young twigs. The gum (hardened resin) of black spruce is a commercial product. Dyes have been made from turpentine obtained as a by-product in the manufacture of paper. See FIR.

G.M.S.

Scientific Names. The spruce genus is *Picea*, family *Pinaceae*. The white spruce is *P. canadensis*; the black, *P. mariana*; the red, *P. rubra*; the Sitka, *P. sitchensis*; the Norway, *P. excelsa*. The Douglas spruce, or fir, is *Pseudotsuga douglassii*.

SPRUCE KNOB, the highest point in West Virginia. See WEST VIRGINIA (The Land).

SPRUCE PARTRIDGE. See GROUSE.

SPRUCE WOODS RESERVE. See MANTOBA.

SPURGE FAMILY, OR EUPHORBACEAE, *yu fawr be a' se e*, a family of herbs, shrubs, and

trees, including about 4,000 species, many of which are the source of very useful products. Castor oil, croton oil, cassava, and rubber are among these products. The family includes also several ornamental plants, among them the poinsettia. Members of the spurge group bear small, inconspicuous flowers, but these sometimes have bracts (see BRACT) of very brilliant hues. A biting, milky juice is a common characteristic of the plants. In Africa there are several species that can with difficulty be distinguished from cacti, when not in bloom. The plants of this family are especially abundant in the tropics.

B.M.D.

Related Subjects. For other details, the reader is referred in these volumes to the following articles:

Cassava
Castor Oil
Poinsettia

Rubber and Rubber
Manufacture
Tapioca

SPURGEON, CHARLES HADDON (1834-1892), one of the best-known English preachers of his day, was born at Kelvedon, in Essex, studied at Colchester and at Maidstone, and, by the time he was fifteen years old, had become usher in a school at Newmarket. Meanwhile, he had joined the Baptist Church, and was preaching in and near Cambridge; his youthfulness attracted large audiences and his vigorous independence of thought held them. In 1854 he became pastor of the Baptist Chapel in New Park Street, London, and in 1861 the great Metropolitan Tabernacle, seating 6,000 people, was opened. There he preached for the rest of his life. Out of his work grew a system of schools and almshouses, a pastors' college, the Golden Lane Mission, and the Stockwell Orphanage.

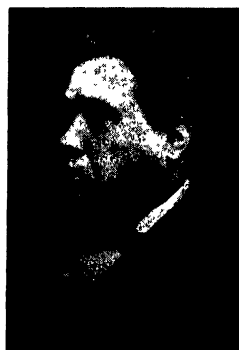


Photo: Brown Bros.

CHARLES H. SPURGEON

Writings. His sermons, marked by simplicity, earnestness, and unflinching humor, were published each week, and reached all English-speaking countries. He also wrote *The Saint and His Saviour*, *John Ploughman's Talks*, *The Treasury of David*, *Types and Emblems*, and *The Present Truth*, and edited a monthly magazine, *Sword and Trowel*.

SPUYTEN DUYVIL, *spi' ten di' v'l*, CREEK. See NEW YORK CITY.

SPY, in military usage, a term defining any person who abandons the uniform or distinctive badge of his service, in order to mingle with the enemy, for the purpose of obtaining information of value to the army he is serving. It is clearly agreed in international warfare that a soldier in uniform, no matter under

what circumstances he is taken, cannot be considered a spy. Civilians openly carrying messages are not spies, and are not subject to the ignoble death meted out to those who go in disguise, in order to penetrate the enemies' lines. Aviators and balloonists who reconnoiter or "spy out" the position of forces are not spies. A spy is one who acts clandestinely or under false pretenses. To be condemned as a spy, a person must actually be taken within the lines of the enemy, in disguise, or while pretending to be other than what he really is.

Even a spy must receive trial before punishment. Death by hanging or shooting is prescribed in usages of war for all condemned spies. As an illustration of the status of a spy, the celebrated case of Major André, hanged in 1780, affords a striking example. He was caught within the lines of the United States army, in disguise. Not being in uniform, he was not entitled to the treatment due to an honorable combatant. Had he reached the British lines and afterward been captured, although known once to have acted as a spy, he must then have been treated simply as any other prisoner of war.

The term is also applied in time of peace to those who try to collect information in one country which would be valuable to another country. Special laws deal with such cases.

Related Subjects. See HALE, NATHAN, for the history of a devoted man who sacrificed his life as a spy; also, ANDRÉ, JOHN.

SPY WEDNESDAY. See HOLY WEEK.

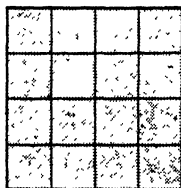
SQUADRON, *skwad' run*, a naval and military term describing a division of a regiment of cavalry or fleet of ships. In the United States army, a squadron is commanded by a major and consists of not less than two, nor more than four, troops. A naval squadron may consist of from two to eight war vessels, under the command of a junior flag officer. See ARMY; NAVY.

SQUAM LAKE. See NEW HAMPSHIRE (Rivers and Lakes).



a

b



SQUARES

Explanation of figures appears in the text.

SQUARE, a plane figure having four equal straight sides and having four right angles (see *a* in diagram).

The number of square units in a square is the product of the number of units in the length

and the number of units in the width, as in any rectangle. But since the length and width of a square are equal, the area is found by multiplying one side by itself, or by squaring one side. The square of a number is indicated by placing the exponent 2 to the right and above the figure denoting the number to be squared; thus, $4^2 = 4 \times 4$ or 16. In *b* of the accompanying illustration, we have a square whose sides are each four units in length. The area is therefore 4×4 , or 16, square units.

What is the area of a square city block 600 feet long?

One side = 600 ft.

Area in sq. ft. = $600^2 = 360000$

When the area of a square is known, one side may be found.

What is the side of a square whose area is 144 square feet?

The problem becomes: What number multiplied by itself gives 144? It is expressed thus:

$\sqrt{144} = ?$ The answer, or 12, is called the *square root* of 144. The problem is expressed thus:

Area of square = 144 sq. ft.

1 side in ft. = $\sqrt{144} = 12$

The line upon which a square is built is called the base of the square. J.W.V.

Related Subjects. In connection with this discussion of the square, the reader is referred to the following articles in these volumes:

Mensuration	Rectangle	Square Measure
Quadrilateral	Rhombus	Square Root

SQUARE MEASURE, the system used in the measurement of surfaces. The name is taken from that of the square, or the unit employed in finding the area of a surface.

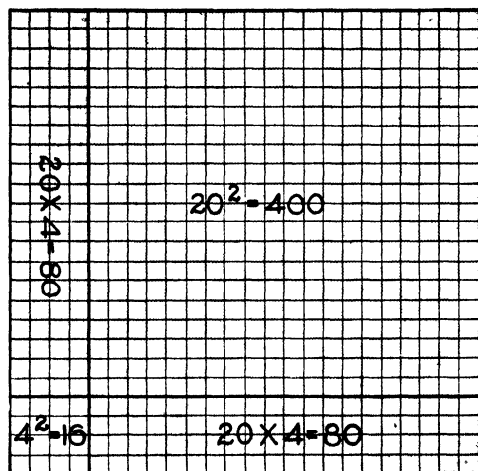
Related Subjects. The table of common square measure is given in these volumes in the article DENOMINATE NUMBERS. For applications of the principles of square measure, see MENSURATION.

SQUARE ROOT. On a line 4 inches long build a square. The area of the square is 16 square inches. On a line 9 feet long build a square. The area of the square is 81 square feet. On a line 8 units long build a square. The area is 64 square units.

The drawing of many squares on cross-section paper, as suggested above, shows the meaning of a square, and makes clear the relation of the area of a square to one of its sides; namely, the number of square units in the area is equal to the number of units in one side multiplied by itself. This product is called "the square" of the number. "The square" is used to designate the product obtained by multiplying a number by itself, whether or not that product is thought of geometrically as a square. The square of a number is indicated by a little figure called an *exponent*; thus, $4^2 = 16$; $9^2 = 81$.

The above are read: 4 squared = 16; 9 squared = 81; or the square of 4 = 16; the square of 9 = 81.

The area of a square is 144 square feet.
What is one side? 12 feet.
The area of a square is 169 square miles.
What is one side? 13 miles.



Note the relation between areas and sides below.

Area	Side
400 sq. ft.	20 ft.
36 sq. in.	6 in.
49 sq. yd.	7 yd.
121 sq. rd.	11 rd.

Finding the line upon which a square is built, or finding what number multiplied by itself gives a certain square, is called "finding the square root of the number"; that is, finding the line or number out of which the square grows. And, as is usual in mathematics, there is a sign used to indicate what is sought; thus, $\sqrt{25}$ stands for the number which multiplied by itself makes 25. The sign is called the radical sign—root sign.

Find the values of the following:

3^2	$\sqrt{64}$
5^2	$\sqrt{6400}$
1^2	$\sqrt{144}$
14^2	$\sqrt{14400}$
30^2	$\sqrt{34}$
$(\frac{1}{2})^2$	$\sqrt{36}$
$(\frac{3}{4})^2$	$\sqrt{25}$
40^2	$\sqrt{25}$
$(2\frac{1}{2})^2$	$\sqrt{.0025}$
17^2	$\sqrt{169}$
$(\frac{5}{8})^2$	$\sqrt{225}$

Squaring a Number Consisting of 10's and Units. Square 46.

$$\begin{array}{r}
 46 = 4 \text{ tens} + 6 \text{ units} \\
 46^2 = (40 + 6)^2 \\
 40 + 6 \\
 40 + 6 \\
 \hline
 40 \times 40 + (40 \times 6) + (40 \times 6) + 6^2 \\
 1600 + 480 + 480 + 36 = 2116
 \end{array}$$

$$\begin{array}{r}
 39^2 = (30 + 9)^2 = 30^2 + 2 \times (30 \times 9) + 9^2 \\
 39 \\
 39 \\
 \hline
 81 = 9 \times 9 \\
 270 = 9 \times 30 \\
 270 = 30 \times 9 \\
 900 = 30 \times 30 \\
 \hline
 1521 = 39 \times 39
 \end{array}$$

The square contains the square of the tens, twice the product of the tens by the units, and the square of the units. This may be put into a more concise form, thus:

$$\text{number}^2 = \text{tens}^2 + 2 \times \text{tens} \times \text{units} + \text{units}^2$$

Many numbers of this class should be squared on cross-section paper by students taking up the subject of square root.

The root is found by taking the square apart along the lines upon which it was built up. In other words, it must be taken apart along its construction lines.

Square Root of Numbers Consisting of 10's and Units. What number squared gives 2025?

$$\begin{array}{r}
 n^2 = 2025 \\
 n = \sqrt{2025} \\
 2025 = \text{tens}^2 + 2 \times \text{tens} \times \text{units} + \text{units}^2 \\
 40 + 5 \\
 2025 \\
 1600 = \text{tens}^2 \\
 \hline
 2 \times 40 = 80 \quad 425 = 2 \times \text{tens} \times \text{units} + \text{units}^2 \\
 400 = 2 \times \text{tens} \times \text{units} \\
 25 = \text{units}^2 \\
 25 = \text{units}^2
 \end{array}$$

Explanation:

- (1) What is the largest square of tens in 2025? 1600.
- (2) What, then, is the tens? 40.
- (3) Place 40, or 4 tens, in the root.
- (4) Subtract 1600; the remainder 425 must contain $2 \times \text{tens} \times \text{units} + \text{units}^2$.
- (5) Units², being comparatively small, may be neglected for the time; and $425 = 2 \times \text{tens} \times \text{units}$.
- (6) The tens is 40; and $425 = 2 \times 40 \times \text{units}$.
- (7) Divide 425 by 2×40 and find units to be 5.
- (8) Subtract 5×80 from 425.
- (9) The remainder must be units².
- (10) It is found to be so— $25 = 5^2$.

When dividing by $2 \times \text{tens}$, we must bear in mind that there must be a remainder equal to the units². The following problem illustrates the point:

$$\begin{array}{r}
 \sqrt{784} = n \\
 20 + 8 = 28 \\
 \hline
 784 = t^2 + 2 \times t \times u + u^2 \\
 400 = t^2 \\
 \hline
 2 \times 20 = 40 \quad 384 = 2 \times t \times u + u^2 \\
 \hline
 320 \\
 64 = u^2 \\
 \hline
 64 = 8^2
 \end{array}$$

Note that, when 384 is divided by 40, it seems that the quotient is 9. But upon taking out 9×40 , there is not enough left to give units²; the remainder is $384 - 360$ or 24, which is not 9^2 . So we see the quotient is only 8, giving a remainder of 64, which is 8^2 .

Squares of numbers from 10 to 100 have three or four digits; squares of numbers from 100 to 1000 have five or six digits. So the square root of any number of three or four digits lies between 10 and 100; that is, has two digits. The square root of a number of five and six digits lies between 100 and 1,000; that is, has three digits. Therefore, in finding the square root, an integral number is separated into groups of two digits each, beginning at the right. The number of digits in the root is equal to the number of groups; for example, $\sqrt{72'25}$ has two digits, $\sqrt{1'63'84}$ has three digits, $\sqrt{10'49'76}$ has three digits.

A decimal number is divided into groups, *beginning at the decimal point*, and counting to the left and to the right; for example, $\sqrt{2'07.36}$, $\sqrt{2'08.22'49}$.

The usual concise method of solution is as follows:

$$\begin{array}{r}
 28 \\
 \hline
 7'84 \\
 4 \\
 \hline
 2 \times 20 = 40 \quad 3 \ 84 \\
 +8 \quad \hline
 48 \quad 0
 \end{array}$$

Here the zeros showing the full value of tens and tens² are dropped, and units when found is added to the "trial divisor" ($2 \times$ tens) before multiplication, thus including the square of the units in the product. Students taking it up in arithmetic will more easily understand the first method given here.

Square Root of Numbers of More than Four Digits. Find the square root of 104976.

$$\begin{array}{r}
 \sqrt{104976} = n \\
 300 + 20 + 4 = 324 \\
 \hline
 104976 \\
 90000t^2 \\
 \hline
 2 \times 300 = 600 \quad 14976 = 2 \times t \times u \\
 \hline
 12000 \\
 2976 \\
 400 = u^2 \\
 \hline
 2 \times 320 = 640 \quad 2576 = 2 \times t \times u \\
 \hline
 2560 \\
 16 = u^2 \\
 \hline
 16 = 4^2
 \end{array}$$

After 320 is found, we know there are 32 tens in the root, and after taking out 20^2 , or 400, we proceed to find units. The process is shortened below:

$$\begin{array}{r}
 324 \\
 \hline
 10'49'76 \\
 9 \\
 \hline
 2 \times 30 = 60 \quad 149 \\
 \hline
 2 \quad 124 \\
 \hline
 62 \\
 2 \times 320 = 640 \quad 2576 \\
 \hline
 4 \quad 2576 \\
 \hline
 644
 \end{array}$$

Square Root of Decimal Numbers. (1) A product contains as many decimal places as the two factors that make it.

(2) The square is a product and the factors are equal.

(3) Therefore a square always has an *even* number of decimal places, and the root has one-half as many decimal places as the square.

(4) To find the square root of a decimal number, (a) work as if it were an integer; (b) point off one-half as many decimal places in the root as there are in the square.

$$\begin{array}{r}
 \sqrt{1.44} = 1.2 \\
 \sqrt{.64} = .8 \\
 \sqrt{.625} = \sqrt{.6250} = n \\
 \hline
 .79 \\
 .62'50 \\
 49 \\
 \hline
 2 \times 70 = 140 \quad 1350 \\
 \hline
 9 \quad 1341 \\
 \hline
 149
 \end{array}$$

Note that .625 has but three decimal places; add one place, so that it has an *even* number of decimal places.

A root is carried out as many decimal places as desired, by annexing *two* decimal zeros to the square for *each* decimal place desired in the root; for example, find $\sqrt{3}$ to two decimal places.

$$\begin{array}{r}
 1.73 \\
 3.00'00 \\
 1 \\
 \hline
 2 \times 10 = 20 \quad 200 \\
 +7 \quad \hline
 27 \quad 189 \\
 \hline
 27 \\
 2 \times 170 = 340 \quad 1100 \\
 +3 \quad \hline
 343 \quad 1029
 \end{array}$$

A method preferred by many rests on the obvious fact that, if a number is divided by its square root, the quotient must equal the divisor. Hence, to find the square root of a number, make as shrewd a guess as possible at the result, and divide the number by your guess. If the quotient is equal to your divisor, the desired square root is found. If the quotient is larger (smaller) than the divisor, your guess was too small (too large). Repeat the

process with a new divisor between your original one and the original quotient, until divisor and quotient become equal.

For example, find $\sqrt{682}$. The square root is clearly between 20 and 30. Let us try 25. $682 \div 25 = 27.28$. The desired square root is between 25 and 27.2. Let us try 26.1, halfway between 25 and 27.2. $682 \div 26.1 = 26.13$. Hence, to one decimal place, $\sqrt{682} = 26.1$. The process can evidently be carried to as many decimal places as may be desired. J.W.Y.

SQUASH, a plant of the gourd family, cultivated for its fruit. It is a familiar and well-liked garden vegetable. Squash is cooked in various ways. It is most commonly served in the same way as mashed potatoes, or used as filling for pies. The plant grows as a trailing vine and as a bush, and bears large green leaves with many lobes, and large, tubular, orange-yellow flowers. There are two general kinds, the *summer* and the *winter*. Summer varieties, represented by the *simling* and the *crookneck*, usually grow as bush plants. The fruits are usually smaller than winter varieties, and the plants have hard, dense stems. Summer squash will grow in the shade of cornstalks or in a sunny situation, and will endure both heat and drought, as this type adapts itself readily to almost any condition. A summer squash is gathered and eaten before fully ripe.

Winter varieties, represented by the *Hubbard*, are usually vine plants. The fruits are heavy and thick-skinned. They are allowed to come to maturity, but must be gathered before frost injures them; if stored in a dry place, they will keep through the winter. The best-liked varieties retain their green color when ripe. Squashes do best in a soil containing a good deal of humus. Bush varieties are planted in hills about four feet apart each way, but trailers need more space.

Squash Bug, an ill-smelling insect that attacks both squash and pumpkin vines. It is slightly more than half an inch long, and is brownish-black above and dirty yellow below. Adult insects sleep through the winter. The eggs are laid in the spring on young leaves and sprouts, and the young hatch in about two weeks. They injure the growing plants by sucking the sap. There are several measures used to combat the pest. One of these is picking the bugs off the

vines before the eggs are laid. Young plants should be protected by means of frames covered with mosquito netting. Bugs can be trapped under shingles placed about the vines, and can then be destroyed. Any egg clusters found should be crushed. B.M.D.

Scientific Name. Squashes belong to the family *Cucurbitaceae* and the genus *Cucurbita*.

SQUATTER. See **SQUATTER SOVEREIGNTY** (Origin of Terms).

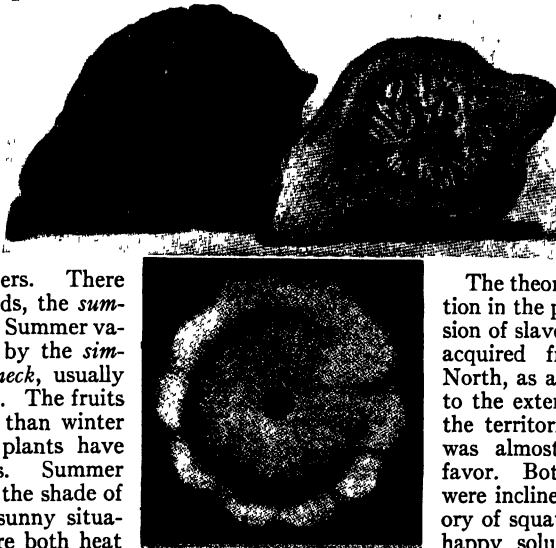
SQUATTER SOVEREIGNTY, OR POPULAR SOVEREIGNTY, in the history of the United States, was the doctrine that the inhabitants of a territory had the right to regulate their internal affairs without interference from the national government. The origin of

this theory is unknown, but it was Lewis Cass (December, 1847) who first publicly proclaimed it, in the suggestion that the territories be allowed "to regulate their internal concerns in their own way."

The theory first found application in the problem of the extension of slavery into the territory acquired from Mexico. The North, as a whole, was opposed to the extension of slavery into the territories, while the South was almost unanimous in its favor. Both North and South were inclined to regard the theory of squatter sovereignty as a happy solution which relieved the states and Congress of a difficult problem.

In the Compromise of 1850, the principle seems to have been recognized, because of the omission of reference to slavery in Utah and New Mexico; and in the Kansas-Nebraska Bill of 1854, it was expressly adopted as a basis. Soon afterward, however, the doctrine was repudiated by the South, which declared that Congress had no jurisdiction over slavery in the territories. In the election of 1860, the dispute caused a split in the Democratic party, the Northern wing nominating for President Stephen A. Douglas, who had been for ten years the foremost advocate of popular sovereignty. The Southern wing, demanding that Congress take vigorous action to defend slavery in the territories, nominated John C. Breckinridge. With the close of the War of Secession and the abolition of slavery, the question lost all political significance.

Origin of Terms. The terms *squatter sovereignty* and *popular sovereignty* originally had different mean-



SQUASHES

Above, the warted Hubbard squash, showing exterior and longitudinal section. Below, a mountain white bush squash.

ings, and their confusion in United States history is unfortunate. A *squatter* was a settler who occupied land without having acquired legal title to it, and the old doctrine of "squatter sovereignty," dating from colonial times, gave him legal title, after a certain period of years, if the rightful owner did not appear and enter a protest. Thus the name *squatter sovereignty* came into more general use than the correct term, *popular sovereignty*, or sovereignty inhering in the people.

Related Subjects. The reader is referred in these volumes to the following articles:

Compromise of 1850
Douglas, Stephen A.
Kansas (History)

Kansas-Nebraska Bill
Political Parties
Slavery

SQUAW MINT. See PENNYROYAL.

SQUID, *skwid*, a sea mollusk having an internal shell and ten movable arms about the mouth. The *common squid*, which inhabits the coast waters from Maine to South Carolina, is typical of the family. It has a long, pointed body, with two fins at the posterior end, united at the back. Two of its ten arms are longer than the other eight, but all have rows of sucking organs. It has a large head, and a mouth equipped with two horny jaws and a rasping tongue. The body of the squid is spotted with several different tints, and it can change its color at will to correspond with its environment. Like others of its family, it has an ink bag from which it ejects a dark fluid to discolor the water when fleeing from an enemy. Aided by their sucking discs and movable arms, the squids successfully prey on small fish, and they themselves are eaten by fish, eels, dolphins, and sea birds.

The common squid is from eight to twenty inches in length, but there are giant specimens off the Newfoundland coast, with bodies from eight to ten feet long and tentacles attaining a reach of forty feet. Sailors tell nearly unbelievable stories of squids having sucking discs as large as dinner plates. S.H.S.

Classification. Squids belong with the nautilus, octopus, and cuttlefish in the class *Cephalopoda* of the subkingdom *Mollusca*. The common squid is classed as *Loligo pealii*, family *Loliginidae*.

SQUILL, the name of several plants with bulbous roots, belonging to the lily family. A species known as the *sea onion*, which grows in countries around the Mediterranean, produces bulbs sometimes weighing four pounds and of medicinal value. They are collected in August. The outer husk is removed, and the bulb is sliced and dried in the sun. The drug made from these bulbs is generally used in the forms of syrup and the tincture of squill. It stimulates the heart and has decidedly irritating qualities, affecting particularly the stomach, intestines, and bronchial tracts, and for this reason it cannot be given alone. Squill is sometimes used in chronic bronchitis, but never in the acute disease. Its use is decreasing, be-

cause its irritant qualities overbalance the good it may do. B.M.D.

Scientific Name. Squill belongs to the family *Liliaceae*. Its botanical name is *Urginea maritima*.

SQUINT, OR STRABISMUS, *stra biz' mus*. Under normal conditions, the two eyes can be directed toward an object with the same axis of vision. There are six muscles which make this possible—attached above and below and on each side of the eyeball. Injury to one or more of these muscles causes the affected eye to turn out of its normal position. Sometimes both eyes are affected. That form of squint is most common in which the eye or eyes seem to be looking at the nose. Neglect of such conditions often causes blindness in one or both eyes. Wearing correct glasses helps in many cases. Even very young cross-eyed children should be fitted with proper glasses. Sometimes the defect is corrected by operation, but the best procedure in each case must be determined by a competent eye specialist. Because of the great advance made in recent years in the treatment of eye troubles, squint is much less common than formerly. See EYE. W.A.E.

SQUIRE, OR ESQUIRE, the second step toward knighthood (which see). See, also, CHIVALRY.

SQUIRREL, *skwur' el*. Squirrels are among our most interesting and popular forms of wild life. They are a group of rodents, or gnawing



Photo: U & U

"OSWALD" WAS IN DISGRACE

He is one of the animal pets in Lincoln Park, Chicago. A friendly interest in him led one of the keepers to find out how he was prepared for the coming winter. His nest was searched, and in it thirty-two golf balls were found. It was learned that it was Oswald's habit to visit the golf links soon after daylight in search of the balls, which he carried to his winter quarters. The photograph shows him as he appeared before his accusers.

animals, that live in trees or under the ground, and are found in woodlands in nearly all parts of the world. Australia is the only continent from which they are absent. Squirrels are



graceful, agile animals with long, plumelike tails and somewhat slender bodies. Some are but a few inches in length, and others are as large as a full-grown cat. Their color ranges from black through reddish-brown to gray. The habits of the typical squirrel are suggested in these lines from Mary Howitt's popular poem:

In the joy of his nature he
frisks with a bound
To the topmost twigs, and
then to the ground;
Then up again, like a
winged thing,
And from tree to tree with
a vaulting spring;
Then he sits up aloft, and
looks waggish and
queer,
As if he would say, "Ay,
follow me here!"

And then he grows pettish, and stamps his foot;
And then independently cracks his nut;
And thus he lives the whole summer through,
Without a care or a thought of sorrow.

Squirrels do take thought of the future, however, for they store away nuts to last them through the winter.

There are so many species, and varieties within the species, that no accurate count of the number of kinds of squirrels has been made. Some of the more important species are as follows:

Red Squirrel, or Chickaree. Ranging from Northern United States to the tree limit in Canada, the red squirrel is the most widely



THREE OF THE SQUIRRELS

Upper left, the flying squirrel. At right, the Raibab squirrel, found only on the plateaus north of the Grand Canyon of the Colorado; it is about the size of the fox squirrel. Below, the California ground squirrel.

distributed of several American species. It is an active little creature, not over eight inches long, excluding the bushy tail. Its upper parts are chestnut-red, the lower parts white, and there is a black stripe along each side. The ears have on the tip a tuft of hairs. This squirrel lives almost entirely in trees, seeking a home in a hollow trunk or making a special nest of leaves and twigs. Its favorite diet of nuts and grain is varied by birds' eggs, young birds, insects, fruits, and tender twigs. Red squirrels keep up a shrill, noisy chattering. Their young, of which there are three or four

to a litter, are born in the spring.

Gray Squirrels. There are a number of species of gray squirrels in America. One of the commonest ranges from New England west to Minnesota, and is hunted in the East, both for its skin and its flesh. This squirrel is ten inches long. Like the red squirrel, it eats the young and eggs of birds, but is less prone to this bad habit than its smaller brother. One of its means of escaping the notice of its own enemies, particularly the hawk, is to flatten out on the side of a horizontal branch; in this position, its gray-coated body is even more inconspicuous than usual. Gray squirrels have a habit of calling to one another by "barking," or uttering a series of sounds that end in a sort

of snarl, often distinctly audible for an eighth of a mile. They are often seen in city parks, where they become so tame that they sometimes climb on the shoulders of passers-by. There are other species of gray squirrels in the southwestern part of the United States and in California.

Fox Squirrels. The fox squirrels are larger and handsomer than any of the species mentioned above. They are found in the Middle states and in the South. Some are jet black, others reddish-gray, and there are others with colors ranging between these shades.

Other Kinds. In Europe there is a *common squirrel* which ranges all over the continent. It is colored like the chickaree, but is somewhat larger. The squirrels of the tropics are noted for their brilliant coloring, and there is an Oriental species which changes its gray coat for one of bright orange-yellow in the breeding season. This is the only known mammal which has a variation of color corresponding to the changes in the plumage of birds.

There are two other interesting groups of squirrels, namely, those that live in burrows in the ground, and those that leap from tree to tree, as if flying. W.N.H.

Scientific Names. The squirrel family is known scientifically as *Sciuridae*. The red squirrel is *Sciurus hudsonicus*; the common gray, *S. carolinensis*; the fox squirrel of the Middle states is *S. niger rufiventris*; that of the South is *S. niger*.

SQUIRRELTAIL GRASS, a name frequently applied to WILD BARLEY (which see).

SRINAGAR, *sre nah gur'*, OR **SERINAGUR**, *se re' nuh gur*. See INDIA (The Cities).

STABLE EQUILIBRIUM. See the article GRAVITY, CENTER OF.

STABILIZER, AIRPLANE. See AIRCRAFT, page 125.

STACK, SIR LEE. See EGYPT (Egypt a Kingdom).

STADACONA, *stah dahk' o nah*, an Indian town where now stands the city of Quebec. See QUEBEC (History).

STADIUM, *sta' dih um*, originally, the foot-race course in Olympia, Athens, and other places in Greece where athletic contests were celebrated. The name in modern usage refers to a great uncovered structure, with seats arranged in tiers, from which spectators view football and baseball games, track meets, and other sports and contests. Universities, in particular, are more and more erecting these huge stadiums for athletic games. In many cases, they have been financed by students and alumni as memorials to those who gave their lives in the World War. The magnificent structure on the lake front at Chicago is an example of a municipal stadium.

The following table gives the names and seating capacities of the fifteen largest stadiums of America:

NAME AND LOCATION	APPROXIMATE SEATING CAPACITY
Sesqui-Centennial, Philadelphia, Pa. . . .	125,000
Soldier Field Municipal Stadium, Chicago, Ill.	120,000
Stanford Stadium, Stanford U., Stanford University, Calif.	88,000
Franklin Field, U. of Penn., Philadelphia, Pa.	83,500
California Memorial Stadium, U. of Calif., Berkeley, Calif.	80,000
Los Angeles Coliseum, U. of So. Calif., Los Angeles, Calif.	80,000
University of Michigan Stadium, Ann Arbor, Mich.	80,000
Yale Bowl, Yale U., New Haven, Conn.	80,000
Venable Stadium, Baltimore, Md.	78,000
Memorial Stadium, U. of Mo., Columbia, Mo.	76,000
Yankee Stadium (Baseball), New York City, N. Y.	72,000
Pitt Stadium, U. of Pitts., Pittsburgh, Pa.	70,000
Ohio Stadium, Ohio State U., Columbus, O.	63,000
Memorial Stadium, U. of Ill., Urbana, Ill.	60,000
Nebraska Memorial Stadium, U. of Neb., Lincoln, Neb.	60,000

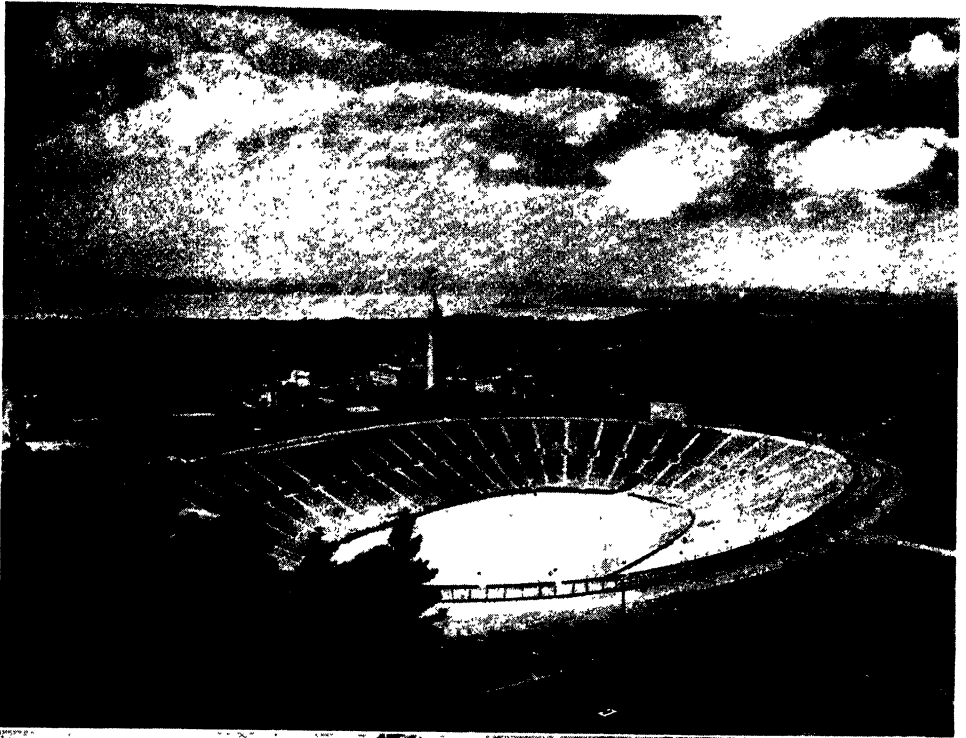
The famous stadiums of ancient Greece were usually enclosed by terraces having the general shape of a horseshoe, which afforded the spectators a clear view of the field. Occasionally, these terraces had seats. The ancient stadium at Athens has been restored, and served as the scene of the Olympian Games in 1906.

The stadium was also a measure of distance among the Greeks. It was the distance between the terminal pillars of the stadium at Olympia, and was the equivalent of 606 feet 9 inches, in English measurement.

STADTHOLDER, *stah't hohl dur*. See NETHERLANDS, THE (History).

STAËL-HOLSTEIN, *stah' el hohl' stine*, ANNE LOUISE GERMAINE (1766-1817), generally known as MADAME DE STAËL, a French writer, daughter of Jacques Necker (which see). She was by nature an unusually bright child, and her association with the brilliant people who frequented her father's house increased her interest in intellectual matters and in the affairs of the times. At the wish of her parents, she married the Swedish minister, Baron de Staël-Holstein, who was much older than she, and with whom she was far from happy. The marriage terminated in a friendly separation, and Madame de Staël continued to live an independent life.

In 1788 she published her *Letters on Jean Jacques Rousseau*, a very enthusiastic comment, and in various ways showed her approval of the sentiments and events of the early



Photos: U & U

Outlets for Football Enthusiasm. Above, the stadium of the University of California; it is typical of stadiums of the bowl type. Below, a photograph of a small section of the great crowd at an intercollegiate football game.

months of the Revolution. Later, however, when she felt that the reformers were becoming extreme, she was active in defense of the royal family, and carried her advocacy so far that she was obliged to flee from the country. She returned in 1794 to Paris, but nine years later was banished by Napoleon, who was suspicious of her motives. During the years of her exile, she lived in Germany, and there became acquainted with the greatest literary men of the time, including Goethe, Schiller, and Schlegel.



Photo: Brown Bros.

MADAME DE STAËL

Place in Literature. Her works of importance, in addition to the volume referred to above, include the novels *Delphine* and *Corinne*, once very popular but now comparatively little read; *Literature in Its Relation to Social Institutions*; *On Germany*; and *Thoughts on the French Revolution*. More important than any single work was her influence in introducing the Romantic movement into France, which up to that time had never freed itself from classic formalism. In this great movement, she may be regarded as the foremost figure, and is thus ranked as one of the notable literary personalities of France.

STAFF, an inexpensive compound resembling plaster and used instead of stone for temporary buildings, architectural decoration, and statuary. It consists chiefly of plaster of Paris and hydraulic cement, mixed in water with dextrin and glycerine. Staff was first used as a covering for buildings of the Paris Exposition in 1878, and it was extensively employed on the buildings of the World's Columbian Exposition at Chicago, in 1893; of the Louisiana Purchase Exposition at Saint Louis, in 1904; of the Panama-Pacific Exposition at San Francisco, in 1915; of the Panama-California Exposition at San Diego, in 1915; and of the Sesqui-Centennial Exposition at Philadelphia, in 1926.

STAFF. See MUSIC (A Lesson on the Staff).

STAFF, GENERAL. See GENERAL STAFF.

STAFFA, ISLAND OF. See FINGAL'S CAVE.

STAG, the male of the red deer, the common deer of Europe. A full-grown stag is a handsome animal, standing about four feet high at the shoulder, and with branching horns three feet in length. Hunters find the pursuit of this noble animal a very thrilling sport, as it is fleet of foot, a skillful swimmer, and possessed of keen sight and hearing. The opening canto of Scott's *Lady of the Lake*, which contains a spirited account of a stag hunt, describes a characteristic of the animal in these lines:

As Chief, who hears his warder call,
"To arms! the foemen storm the wall,"
The antlered monarch of the waste
Sprang from his heathery couch in haste.
But, ere his fleet career he took,
The dewdrops from his flanks he shook,
Like crested leader proud and high,
Tossed his beamed frontlet to the sky.

The North American wapiti, or elk (which see), is closely related to the stag. The name *stag* is also applied in a general way to males of other species of deer (see DEER). W.N.H.

Scientific Name. The stag belongs to the family Cervidae. Its scientific name is *Cervus elaphus*.

STAG BEETLE, the name of a family of beetles in which the males of certain species have odd hornlike processes on the mandibles, not unlike the horns of a stag. In some cases, these projections are nearly as long as the body of the insect. Common American species include the *giant stag beetle* of the Southern states, with mandibles an inch long and body one and one-half or two inches; and the *pinching bug* of the Eastern states, an insect that flies by night. The adult stag beetles live in trees and



THE STAG BEETLE

(a) Female; (b) male; (c) grubs.

feed on sap and on honeydew. The eggs are deposited in crevices of the bark, where they hatch into soft, white worms (larvae). See BEETLE. W.J.S.

Classification. The scientific name of the stag beetle family is *Lucanidae*.

STAG-BUSH. See BLACK HAW.

STAGHOUND, a large, white hound with black-and-tan markings, probably descended from the bloodhound. Its head resembles that of a pointer, but the neck is heavier, the ears more hanging and set lower. There are two strains, the *northern* and the *southern*. As the name indicates, these dogs were used for hunting red deer, the male of which is called a stag. Staghounds are found almost exclusively in Europe, and even there they are rapidly being replaced by the foxhound (which see). See, also, DOG. M.J.H.

STAINED GLASS, in reality, is glass stained by chemical process, but the name is also applied to glass which is painted or otherwise

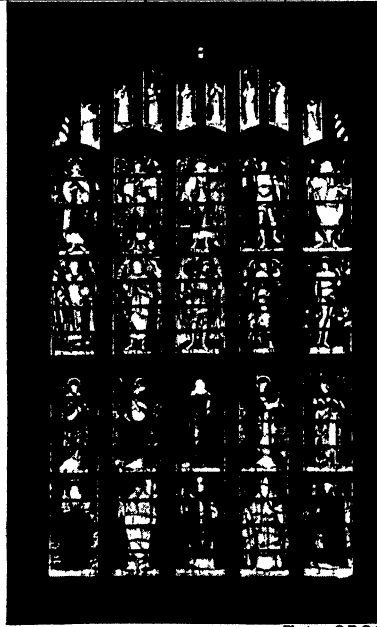


The Stag at Bay. A reproduction of one of Landseer's most notable animal paintings. (See page 6792.)



colored, particularly such glass as is used in what are known as stained-glass windows. In medieval windows of this kind, the color was actually incorporated in the glass by a mixing process in the making of the glass itself. This was called "pot metal." Medieval windows were a patchwork of different colored pieces of glass, made into shapes required by the design of the window, and put together in much the same way as a colored picture puzzle. The pieces of glass were generally held together by strips of lead, soldered together at intervals. The stained glass of medieval days was not made, as it is now, in large panes.

The United States leads the world in the manufacture of stained glass, and the excellence of the product is largely due to the efforts of John La Farge (which see) and of Louis B. Tiffany of New York. The processes of manufacture have greatly changed, and it is now easy to obtain effects such as were absolutely impossible with older methods. It was only at the end of the nineteenth century that the art of glass-staining assumed commercial importance in America. Previous to that time, all stained glass was imported, and but poor imitations of the real art could be obtained. The American artists took up glass-staining at the point where the medi-



Photos: OROO

OF GREAT ARTISTIC MERIT

Above, the famous window in the chapel of New College, Oxford University, England, designed by Joshua Reynolds. Below, window in the chapel of Jesus College, Cambridge University, England, designed by Burne-Jones.

eval artists ceased to develop it. The wonderful stained-glass windows of European cathedrals are priceless chiefly on account of their antiquity. Modern stained glass is superior in effect, coloring, and design. So much has the stained-glass industry of the United States gained ground that considerably more than \$3,000,000 is now invested in the art, and there is little importation from foreign countries. See GLASS (Colored Glass).

STAKED PLAIN. See NEW MEXICO (The Land).

STAKE-DRIVER. See BITTERN.

STALACTITES AND STALAGMITES, *sta lak'-tites, sta lag' mites*, curious and beautiful deposits, ordinarily of calcite, formed in caves and sometimes under stone bridges and arches. Water, percolating through pores and crevices in limestone, takes some calcium carbonate into solution. When it emerges into a cave, and drips from the roof or trickles down the walls, it evaporates and deposits the dissolved material. Stalactites hang from the roof and are formed like icicles, which they resemble; stalagmites, which rise from the floor like inverted icicles, are built up by evaporation from the water falling from above. Sometimes the two forms join in columns and clusters; fantastic curtains and flutings are also formed by water flowing down the walls.

THE SYNDOR of STAINED GLASS



Similar deposits, formed of ice, are common in the ice caves of the Polar regions, and glistening black stalactites of basalt hang from the roofs of some lava caverns.

L.LaF.

Related Subjects. The reader is referred in these volumes to the following articles:

Basalt	Luray Caverns
Carlsbad Cavern	Mammoth Cave
Cave	Vein
Limestone	Wyandotte Cave

STALAGMITES. See STALACTITES AND STALAGMITES.

STALIN, JOSEPH. See RUSSIA (History: Russia Under Bolshevism).

STALWARTS, that group of politicians who fought for a third-term nomination for U. S. Grant for President of the United States. See GARFIELD, JAMES ABRAHAM (The Election of 1880).

STAMBOUL, *stahm buhl'*, the Mohammedan quarter of Constantinople (which see).

STAMBOULISKY, a Premier of Bulgaria. See BULGARIA (History).

STAMEN. See FLOWER (Flower Structure).

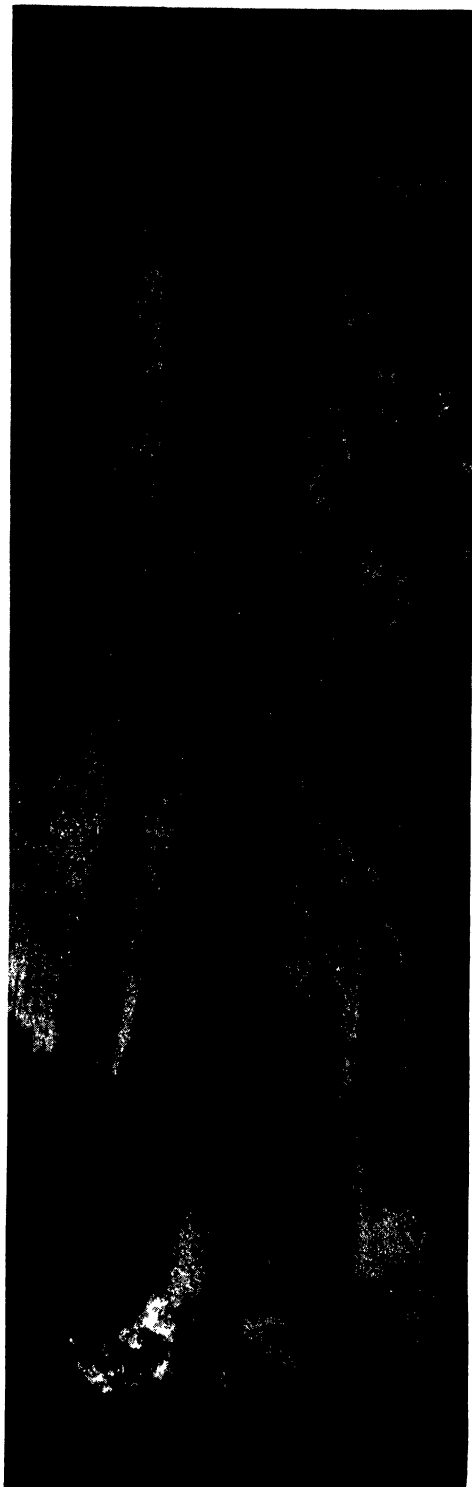
STAMFORD, CONN. See CONNECTICUT (back of map).

STAMFORD BRIDGE, BATTLE OF. See HAROLD (III, Norway).

STAMMERING AND STUTTERING.

These terms are used somewhat interchangeably in describing disordered speech. More correctly, stammering means hesitation in speech, with some tendency to repetition of words or sounds, and some tendency to wrong pronunciation. Stuttering refers to hesitations in which there is some spasm of the mouth muscles, and, at times, grimacing, due to contractions of the muscles of expression. Many persons have these speech defects as the result of idiocy, imbecility, or other serious mental defects. Treatment of the speech trouble when it is a part of feeble-mindedness is without results. More frequently, however, defective speech appears in children of good mental development, but lacking somewhat in emotional stability. There is no abnormality in the vocal cords, mouth, pharynx, nose, or muscles of speech.

The development of a speech disorder is somewhat as follows: A nervous child develops the habit of speaking rapidly, and may be enunciating somewhat differently from the prevailing custom. He may repeat words or sounds. These peculiarities are evident especially when the child speaks rapidly or when excited. If the child becomes aware of his peculiarity, the disorder is made worse. If he



Photo—Wide World

STALACTITES AND STALAGMITES

Photographed in Carlsbad Cavern, New Mexico. Some of them are of somber hue, surrounded by pendants of sparkling white.

falls into a condition of panic, he is apt to develop the spasm features and the grimaces which mark some cases of stuttering. Stutterers commonly sing without any speech disorder. This condition is due to two factors.

In the first place, the words and the air are known, and no mental process except simple memory is required to repeat music. In the second place, the rhythm makes the muscle development of word- and sound-making proceed mechanically. Stutterers recite poetry almost as readily as they sing, and, for the reasons given, they recite prose with a little greater tendency to stuttering, because they no longer have rhythm to help them out. They think out loud when by themselves, with somewhat more tendency to speech disorders. The maximum of the disorder is reached when they must speak in public, extemporizing as they go. In these circumstances, every force making for speech defect may be in operation: self-distrust, panic, fear, self-centering, necessity for thinking a line of thought, of hearing, understanding, replying, and of translating words into acceptable speech, all operating simultaneously.

Treatment. Treatment is a matter of training the mental process and the emotions. Training in the formation of sounds has practically no place in stuttering. The training consists principally in teaching poise, self-confidence, courage, self-forgetfulness, and how to synchronize thought and speech.

These principles are applied to the treatment of stuttering in young children, but in those cases it is even more important that the child should not have his attention called to his defect. A readjustment and a slowing-down of the rhythm at which he moves and talks, stimulated by the example of even movements and calm, low voices about him, are necessary if he is to outgrow the habit. W.A.E.

STAMP, a small adhesive paper, printed or embossed, and authorized by law, which when affixed to papers or documents furnishes evidence of compliance with revenue laws. If the government requires a tax of \$1 on a certain real-estate deed, for example, there must be affixed to that deed some evidence of payment of the fee. A revenue stamp, with an indicated value of \$1, pasted upon the face of the document, is proof that the tax has been paid. Such is the extent of the service performed by stamps of this nature.

Stamp duties were first imposed by the Dutch in 1624. In England the plan was first resorted to in 1694, to raise money for carrying on a war with France. The subject of stamps attesting payment of taxes is of great historical interest to the United States; it was the passing of the Stamp Act of 1765, by the English Parliament, that led directly to the Revolutionary War.

In 1862 the Congress of the United States passed its first law requiring that stamps, especially prepared for the purpose, should be affixed to legal papers and documents, and to packages of many different kinds of merchandise. This was done to raise funds to pay in part the expenses of the War of Secession, and the law was repealed when the necessity was removed. Again, in 1898, a similar law was passed, on account of the war with Spain, and again, twenty years later, to meet a part of the vast sums expended in the World War. These stamps, called internal-revenue stamps, are now required on tobacco, cigarettes, liquors, etc., and on such articles as oleomargarine, snuff, opium, and a great variety of other commercial products, many of them classed as luxuries.

The form of stamp with which people of all countries are most familiar is the postage stamp.

Related Subjects. The reader is referred in these volumes to the following articles:

Internal Revenue
Postage and Postage Stamps

Stamp Act
Tax and Taxes

STAMP ACT. The growing prosperity of the colonies in America, and the increasing debt of the mother country, induced the British



USED UNDER THE STAMP ACT

Three of the stamps which the British government imposed on the American colonies.

Ministry, in 1764, to attempt to raise revenue in America. The purpose was in part to meet home expenses, and partially to make the colonies self-sustaining. In March, 1765, the Stamp Act was passed, imposing a stamp duty on all commercial papers, legal documents, and newspapers. Although the colonies had signified their willingness to raise money to assist in paying the debt incurred by England in the French and Indian Wars, they denied that Parliament had the right, arbitrarily, to impose a tax upon them, since they were not represented in that body. Therefore the publication of the act "operated in America like a spark dropped on a tinder," although the cost of each stamp was trifling.

Patrick Henry denounced the British government and influenced the Virginia assembly to pass resolutions against taxation by Parliament; and, at the request of Massachusetts, a congress in which nine of the colonies were

represented, the first colonial congress in America, met in New York and drew up a statement of the position of the colonies. This was called the Stamp Act Congress. Though the act was repealed in March, 1766, the right to tax the colonies was reiterated. See **REVOLUTIONARY WAR IN AMERICA** (Causes); **UNITED STATES** (History); **STAMP**.

STAMP-COLLECTING. See **POSTAGE AND POSTAGE STAMPS**, subhead; also, a color plate showing more than sixty stamps.

STAMP WEED. See **INDIAN MALLOW**.

STANDARD COINS. See **MONEY**, table of coins.

STANDARDIZATION IN INDUSTRY, a characteristic of modern industrial practice, which consists in conforming to an established weight, measure, size, or other standard, for the sake of economy and ease of manufacture. These standards may be fixed by law, or by common consent and coöperation of the producers. Mass production, a conspicuous feature of American industry, is made possible by this conformity to rule.

In its simplest sense, establishing a standard means setting up some measure by which the form or quality of a product may be judged by the consumer or determined by the manufacturer. The growth of industry in the United States, following the industrial revolution and the introduction of the factory system, resulted in dozens of products for every need, all of them differing in appearance and quality, and all made by differing processes. With no definite standard for horse power, for example, a machine might advertise its pulling power at fifteen horse power, and differ in performance by twenty-five per cent from another machine advertising the same rate. There was nothing to deter a pharmacist from adulterating a drug, if it was not at once noticeable to the consumer. When railroad companies began laying tracks, there was no standard for width between the rails, with the result that cars of one company could not travel on the tracks of another. One can imagine the inconvenience that would have resulted had the standard gauge not been adopted; to-day, vast numbers of freight cars are sent all over the country on rails which have exactly the same gauge.

Inconveniences of this sort are not eliminated, however, for it was said that, until after 1925, more than 600 styles of fire-hose couplings were made; one railroad had to carry more than twenty different adjustments and sizes of couplings, in order to connect its fire-fighting apparatus with the water mains in those cities where it had property to protect. The adoption of the metric system of measures internationally would eliminate much waste now existing.

The Growth of Standardization. Food and drug qualities, some years ago, came under

government control, because they affect individual health; some measures which were universally employed were also made standard. Duplication and industrial waste, however, had to be attacked by the manufacturers themselves.

Naturally, the first attempts at standardization were made by various trade associations and manufacturers, to establish standards for their own products. An example is the association of the various cement manufacturers of the country; when it was discovered that, among the hundred manufacturers, nearly ninety different specifications for portland cement were in use, specifications for a standard product were adopted, and each portland-cement-manufacturer now contributes to a bureau of research which tests his products and experiments in new uses and qualities of concrete.

Coöperation within single industries led to standardization in larger groups, applying to a number of related products. Standard qualities for steel, for example, are of great importance to a manufacturer who uses steel as raw material for his product. As a central agency for this related standardization, there was formed in 1918 the American Engineering Standards Committee, representing the Chamber of Commerce of the United States, trade associations, and other such organizations. This body tries to secure the greatest industrial efficiency, "by singling out specific products and materials, in settling upon their properties and dimensions, and in concentrating on them both in production and in use."

The committee concerns itself with all of the fields in which standardization in industry is possible. They include *names*, that is, definitions of technical terms and standard abbreviations and symbols, and a definite endeavor to standardize the widely varying radio terms; *uniformity* in dimensions of machine parts and supplies, for the sake of making them interchangeable; *specifications of quality* in cement and other products; *methods of testing* and ratings of machinery for durability, strength, etc.; *safety* provisions; and concentration upon the best quantity of types, sizes, etc., of products.

One of the best examples of standardization which may be observed is that in the automobile industry. A committee instructed to set up standards for uniform sizes and parts, quality of fittings and material, and standards of strength, etc., was appointed by the American Society of Automotive Engineers in 1910. The use of these specifications by most of the industry has made mass production possible, with lower cost to producer and consumer, and standards of strength and durability give the consumer his measure of quality. The famous speed of production in the Ford automobile

plant would be impossible if it were not that each part is made to fit exactly, according to a rigid standard, so that no time needs to be lost in adjustment of materials or machinery.

The World War, with its demands for great quantities of munitions, ships, railway cars, etc., accelerated the process of standardization. These orders could not be filled in single factories; the work was divided, each factory handling special parts, which were brought together and assembled for shipping at a central plant. Parts had to fit together so that they could be assembled speedily; this meant that they had to be made according to an exact standard, which was supplied to the factory. Hardly a great American industry fails to apply standardization to all of its tools and processes, and to its raw materials. A glance through magazine advertising will show that this specialization did not disappear at the close of the war, for the raw materials of which automobiles, for example, are made, are themselves standardized—trade-marked products, car bodies, parts, fittings, etc.

A third important agency working for standardization is the United States Department of Commerce, through its Division of Simplified Practice. This bureau assists trade organizations to unite in reducing duplication and waste in their products, chiefly by the elimination of unimportant varieties of merchandise. Much has already been accomplished in the reduction of non-essentials. In so specialized a field as that of men's collars, it was found that 120 different styles were being made, many differing only slightly; the manufacturers reduced this number to about twenty-five. Of the 125 forms, sizes, etc., of metal lath, only twenty-four were retained; of the forty-four different heights, thirty-three lengths, and thirty-four widths of hospital beds being made, one standard size in length, height, and width was retained. In many cases, a reduction of ninety-seven per cent was made, with a vast saving to producers. This process is called *simplification*, and is being applied in many industries. Varieties which are kept are standards until others are devised; manufacturer, merchant, and consumer must be satisfied, and the process frequently necessitates scientific research.

Standardization in Other Countries. Besides its coöperation with Federal standard boards and other bodies, the American Engineering Standards Committee coöperates with such committees in other governments. A recent international conference of twenty nations on standardization made plans for an international standards committee to effect industrial measures which will apply to all countries. A Pan-American conference on the subject, started by the Latin-American countries, was held in Lima, Peru, in 1924.

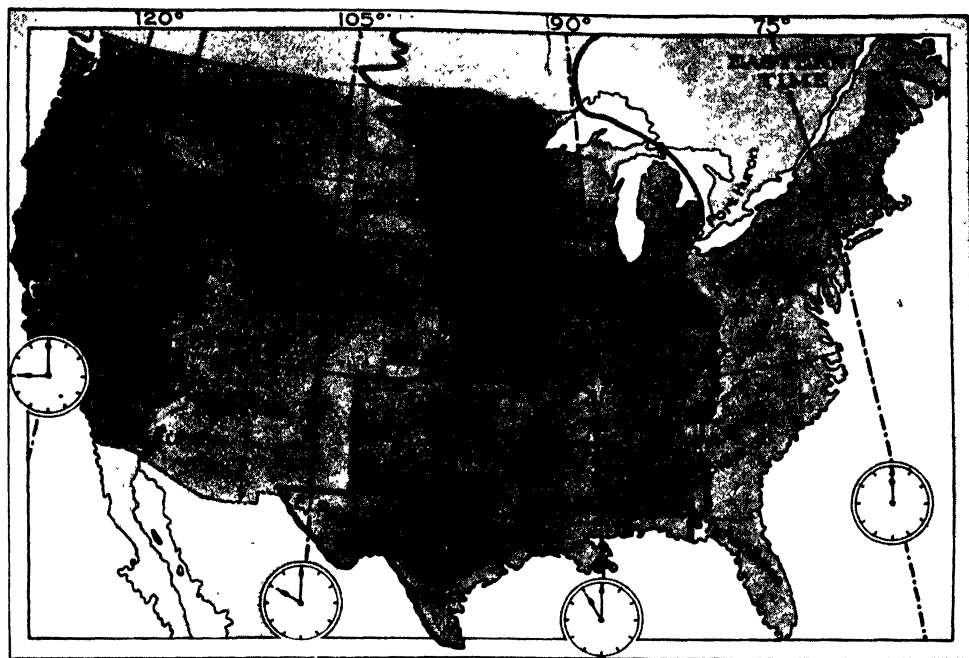
Is Standardization Wholly Desirable? As the foregoing discussion has indicated, standardization simplifies processes, stabilizes production, and saves time and money for the producer. The consumer is assured that his goods will meet certain tests of quality and form, and frequently he can buy them at lower prices than formerly prevailed. The effects of standardization and mass production are not all good, however, even for the producer, for it inevitably slows up some avenues to progress by making industry rigid and inflexible. This is because huge investments in equipment for quantity production cannot be sacrificed or scrapped as soon as new discoveries are made, no matter how reasonable or practical the new discovery may be; economic necessity alone can force the change.

Those who are averse to standardization usually admit its results, but deplore the standardizing tendency in its effect on human beings. They maintain that it replaces beauty and originality of mind. The disadvantages of standardization are equally the characteristic aspects of the machine age in which we live.

STANDARD OF LIVING. See SOCIOLOGY (Applied Sociology).

STANDARD OIL COMPANY. In 1862, only three years after the world's first oil well was sunk, John D. Rockefeller and a few associates began the development of petroleum-refining, but they were not incorporated under the name of the Standard Oil Company until 1870. By 1882 the company had acquired such a commanding position in the growing industry that it was classed as one of the principal business enterprises in the United States, and in that year was organized as the Standard Oil Trust. This name it retained only ten years, because of unfavorable court decisions. By 1911 it had grown to such size and represented so large a proportion of the industry that it was designated a "trust." Under authority of the Sherman Law, and through a decision of the Supreme Court, the Federal government in 1911 dissolved the company. It was then divided into thirty-four parts, and the parent company, the Standard Oil Company of New Jersey, proceeded to distribute to the stockholders the stocks of thirty-three subsidiary companies which it controlled.

Before 1911, the public had known only one Standard Oil Company, but after the dissolution there were thirty-four distinct corporations to reckon with; some were known by such names as Standard Oil Company of New York, Standard Oil Company of Indiana, etc.; and others had entirely different names, such as Atlantic Refining Company, Prairie Pipe Line Company, and Ohio Oil Company. The parent company is still the largest unit. The



THE ZONES OF STANDARD TIME

Standard Oil companies of Indiana, New York, and California are next in size, each with assets in the neighborhood of a billion dollars.

These companies now have no official connections. They are supposed to be competitors, and are prevented by law from forming agreements in respect to prices, market limits, etc.; but there is still a certain similarity of management among some of them, probably owing to an identity of ownership. They are still spoken of as the Standard Oil group, although many of them have long since been without the management which produced the Standard Oil success. See ROCKEFELLER (John Davison); PETROLEUM. F.H.E.

STANDARDS, BUREAU OF. See COMMERCE, DEPARTMENT OF.

STANDARD TIME, the system by which time is now measured in the daily affairs of life in America. When the sun is on the meridian of any particular place, the time at that place is noon. This is true *solar time*, or *sun time*. As the earth turns on its axis from west to east, the sun appears to travel from east to west, and the spot at which the sun is on the meridian is likewise moving from east to west. Thus, the sun is on the meridian at Cincinnati about an hour later than at New York; in other words, when it is noon by sun time in New York, it is only 11:00 o'clock in Cincinnati. At all places east of New York, it is afternoon, because the sun has already passed them. It is clear that every fraction

of a degree of longitude has a different true noon.

A system of standard time was advocated to remedy the confusion which arose from the difference in local sun time. The suggestion was first made by Sir Sandford Fleming (which see). The old system of using sun, or local, time was especially annoying to travelers, for each railroad and city had its own time. The result was that several railroads meeting in a town might all use different time systems; a traveler arriving at a terminus at 10:30 o'clock might wish to take another train at 11:00, and, because of differing time standards, might have to wait an hour or more for his outgoing train, or he might find his train already gone.

The need of a standard for all parts of the world led to the Prime Meridian Conference at Washington, D. C., proposed in 1882, but not held until 1884. In 1883 the railroads of the United States and Canada adopted the system of standard time. The railroads having agreed to a uniform system, it was not long before the use of standard time was general in all lines of enterprise. In some rural communities, the change was slow, but once it was adopted, it was retained because of its simplicity and convenience.

Under the system of standard time, the continent is divided into parallel zones, each of which takes the sun time of practically its central meridian. These central meridians dif-

fer from Greenwich longitude by exact multiples of 15° , this being the distance traveled by the sun in one hour. Thus, the standard-time meridians in North America are 60° , 75° , 90° , 105° , and 120° W. Each zone extends $7^\circ 30'$ east, and the same distance west, of the standard meridian. For practical purposes, the limits of the time zones are not rigid; for example, if a town lies on both sides of a meridian, the same time is kept in all parts of the town; and, particularly in the western part of the United States, the boundaries of zones are uneven, that terminal points of great railroad systems may have the same time as their eastward-stretching divisions.

The time of the 60th meridian is called *Atlantic*, or *Colonial*, time; that of the 75th is *Eastern*; of the 90th, *Central*; of the 105th, *Mountain*; and of the 120th, *Pacific*. These are respectively four, five, six, seven, and eight hours earlier than Greenwich time. An act of Congress in 1918 made standard time legal throughout the United States, added another meridian, 150° west from Greenwich, as the standard for Alaska, and placed any readjustments in the time zones under the jurisdiction of the Interstate Commerce Commission. See DAYLIGHT SAVING.

STÄNDERAT, *shten' de raht*, a legislative body of Switzerland (which see).

STANDISH, MILES, or MYLES (1584-1656), an American colonist, born in Lancashire, England. What little education he possessed was received in that county, but most of his youth was spent in the British army. Before 1603 he had been appointed lieutenant, for bravery in the wars in Holland, and in 1609 he joined the Separatist colony in that country. He was not, however, a member of the church of the Separatists, but was simply their assistant in colonization plans and in training their militia. He was one of the passengers on the *Mayflower*, and immediately after its landing at Plymouth, Mass., was chosen military captain of the colony.

His soldiers were few, but he made such a brave showing with them on several occasions that the Indians greatly feared him. In 1622,

when the savages planned the destruction of both Weymouth and Plymouth, Standish with only eight men attacked their camp, killed their two chiefs, and put the assembled tribes to flight. He had unusual business ability and, as assistant to the governor and treasurer of the colony, secured reductions in British claims that saved the colonists thousands of dollars. *The Courtship of Miles Standish*, by Longfellow, who was a descendant of John Alden and Pris-

cilla Mullins, was not intended to be accurate in every detail, but the main points of the courtship as given in the poem are correct.

Related Subjects.

The article **PLYMOUTH COLONY** (The Honored 102) includes a list of names of the *Mayflower's* passengers, in the exact language and spelling of Governor Bradford. See, also: Alden, John
Bradford, William
Courtship of Miles Standish
Massachusetts Bay Colony
Pilgrims
Plymouth Rock

STANDPIPE.

See RESERVOIR.

STAND UP,

STAND UP, FOR JESUS (hymn). See HYMNS AND HYMN TUNES.

STANFORD, LELAND (1824-1893), an American capitalist and philanthropist, who assisted greatly in building the great West, was born at Watervliet, N. Y. After a brief school course and some study of law in his home town, he went to Port Washington, Wis., in 1849, and there practiced law for three years. He was not very successful, so he moved to California to try gold-mining. In this he made considerable money, but the real basis of his fortune of \$50,000,000 was a mercantile business which he established at San Francisco, in 1856. In 1860 he entered politics as a delegate to the convention that nominated Lincoln, and in 1861 was elected governor of California. In the latter year, he was chosen president of the Central Pacific Railway, then under construction, and did such successful lobbying at Washington that Congress granted large government aid for the road. Stanford was then requested by the directors to take personal charge of the building of that part of the line crossing the Sierra Nevada Mountains, and he established the remarkable record of laying 530 miles of mountain road in 293 days. He also financed successful experiments in moving pictures.



Photo. Visual Education Servi

MILES STANDISH VISITS PRISCILLA



STANDISH, THE CAPTAIN OF PLYMOUTH

Photos: Burbank

It was his boast, according to Longfellow's *Courtship of Miles Standish*, that, like Caesar, "he knew the name of each of his soldiers." He is shown above with his troops on the way to a meeting with the Indians. Below, the grave of Standish, at Duxbury, Mass. (See preceding page.)

Founded a Great University. From 1885 until his death, Stanford was United States Senator from California, but after 1885 the chief interest of his life was in Leland Stanford Junior University (now known as Stanford University), at Palo Alto, Calif. This was a memorial to his son, who died in Rome, Italy, at the age of sixteen. See STANFORD UNIVERSITY.

STANFORD UNIVERSITY, a coeducational institution, is situated thirty-three miles southeast of San Francisco, in the Santa Clara Valley, which, in fertility and natural beauty, is one of the most attractive portions of the state of California. The university was

founded by former United States Senator Leland Stanford and Jane Lathrop Stanford, his wife, in memory of their only son, Leland Stanford, Jr., who died in 1884, at the age of sixteen. The cornerstone of the first building was laid May 14, 1887, and the university was opened to students October 1, 1891.

The buildings of the university are an adaptation of the old Spanish Mission architecture, reproducing, on an imposing scale, the open arches, long colonnades, and red tile roofs of the early missions of California. The central group of buildings constitutes two quadrangles, one surrounding the other, and both connected by arcades. The inner quadrangle

of twelve one-story buildings opens through a continuous arcade upon a paved court, three and a quarter acres in extent, diversified by circles of tropical plants. The buildings of the outer quadrangle are two stories in height, and are surrounded by an arcade opening outward. The soft buff sandstone and grayish-red tile roofs harmonize in the California sunshine with the golden-brown slopes of the Mount Hamilton range of mountains in the foreground, and with the deep blue of the Santa Cruz range in the background.

The scope of the university is indicated by the schools which it includes—schools of biology, education, engineering, letters, and physical and social sciences, besides the graduate schools of business and of law, on the campus, and the school of medicine in San Francisco. The Hopkins Marine Station at Pacific Grove, on the Bay of Monterey, is a branch of the biological work of the university.

Stanford was founded upon a desire to "help equip students for personal success and direct usefulness in life." In the schools which have been established, the university undertakes to give a thorough specialized training, and a steadily increasing number of advanced and professional degrees are granted each year. It has been announced, as a university policy, to eliminate gradually the general and elementary work offered in the first two years, leaving these underclass courses to the Junior Colleges, in order that the university may strengthen and develop advanced undergraduate and graduate study and research. Stanford is thus realizing the desire of the founders, who wanted to "begin where others left off."

The first president of the university was David Starr Jordan (which see), who largely determined the policies of the institution. Its most noted graduate is Herbert Hoover, elected President of the United States in 1928. R.L.W.

STANHOPE, CHARLES, EARL OF. See **PRINTING PRESS.**

STANLEY, FREDERICK ARTHUR, EARL OF DERBY. See **DERBY, FREDERICK ARTHUR STANLEY.**

STANLEY, SIR HENRY MORTON (1840-1904), famous for his discoveries in Africa, was born at Denbigh, Wales, and baptized under the name of **JOHN ROWLANDS**. His father died when Stanley was two years old, and he spent most of his youth in a workhouse, sailing as cabin boy on a vessel to New Orleans, when about eighteen. There a merchant, Henry Morton Stanley, adopted him, but died shortly afterward without making provision for him.

At the outbreak of the War of Secession, young Stanley joined the Confederate army. After his release from prison, he joined the United States navy, becoming ensign on the *Ticonderoga*. Gradually, he took up newspaper work, and his pluck and determination made

him particularly valuable as a correspondent in difficult and dangerous situations. After representing the New York *Herald* in Abyssinia and in Spain, he was commissioned by that paper to "go and find Livingstone." He spent a year in Egypt, Constantinople, the Crimea, Palestine, and Persia, on various missions for the *Herald*, and then embarked for Africa, reaching Zanzibar January 6, 1871. See **LIVINGSTONE, DAVID.**

His African Service.

Starting from Zanzibar in March, 1871, Stanley pushed on to Ujiji, on Lake Tanganyika, where, in November, he found Livingstone. His first speech when he saw the veteran explorer was characteristic: "Dr. Livingstone, I presume?" At Ujiji he remained until January, and, as the older explorer refused to accompany him back to civilization, he left supplies and returned to Europe in 1872.

Two years later, after Livingstone's death, Stanley returned to Africa. He set out from Zanzibar in November, 1874, with three white men and over three hundred natives, and pushed into the interior, sailing about Victoria Nyanza and other lakes, before beginning the most perilous and important part of his enterprise: a journey down the Congo, from its source to its mouth. All of his white companions and half of his native carriers had died before he emerged on the Atlantic coast, in August, 1877, but the course of the great waterway into the heart of Africa had been made clear.

A direct result of this exploration of the Congo was the founding of the Congo Free State, in the interests of which Stanley spent in Africa the years from 1879 to 1884, establishing stations, making treaties with the natives, and collecting much additional geographic information. In 1886 he visited the Egyptian Sudan, his object being the relief of Emin Pasha, and on this expedition he again crossed the continent from coast to coast, passing, as he said, through "miles and miles, endless miles, of forest." This was his last trip to Africa, but he had proved himself one of the greatest and most successful of explorers, and had contributed more to the knowledge of the "Dark Continent" than any other man, with the exception of Livingstone.



Photo: Brown Bros.

HENRY M. STANLEY

He opened the "Dark Continent" to the knowledge of man and to the territorial schemes of the nations of Europe.

Career in England. During these years of active work, Stanley had been a United States citizen, but in 1892 he was renaturalized as a citizen of Great Britain. At the wish of his wife, Dorothy Tennant, whom he had married in 1890, he stood for Parliament, to which he was elected in 1895, as member from North Lambeth. In 1899 he was knighted for his services in Africa.

His Character. The many honors conferred upon Stanley were a just tribute to him. His great success was due primarily to his inflexible will, which took no account of apparently insuperable difficulties, and to his natural ability to deal with savage peoples. He was always truthful and kind in his dealings with the natives, but did not hesitate to force them to do his will, if gentler measures failed and their aid was absolutely essential.

Stanley's Literary Work. His books attained a wide popularity. These, which include *How I Found Livingstone*; *My Kalulu*; *Through the Dark Continent*; *In Darkest Africa*; and *My Dark Companions*, have a charm and a dramatic force which are rare in books of travel.

STANLEY POOL. See CONGO RIVER; also, BELGIAN CONGO (Communications).

STANOVOI, *stah no voi'*, **MOUNTAINS**, a range of mountains in Siberia, about 2,500 miles long, running from the Mongolian frontier in a northeasterly direction, and terminating at East Cape, on Bering Strait. An offshoot extends in a southerly direction through the peninsula of Kamchatka. In reality, the system is a continuation of the Yablonoi range, and is more in the nature of a rugged, elevated plateau than a chain of mountains. The greatest height is attained in Mount Tehokhondo, a little over 8,000 feet above sea level. The drainage from its slopes feeds numerous rivers, the most important of which are the Lena, Amur, and Yenisei. In the extreme northeast, it forms the dividing line between the Pacific and Arctic oceans. As far north as the parallel of 60°, the lower slopes are densely forested, but farther north they become bare and desolate. The whole range is rich in minerals, but it is practically undeveloped, mining as a private enterprise having been possible only since the Russian revolution of 1917, which freed the exiles. These made up the population of the region.

STANTON, EDWIN MCMASTERS (1814-1869), an American statesman, the great Secretary of War in President Lincoln's Cabinet. He was born in Steubenville, O. After two years of study at Kenyon College, he studied law, and was admitted to the bar in 1836. In 1836 he moved to Washington, D. C., where he specialized in practice before the United States Supreme Court. He succeeded Jeremiah Black as Attorney-General in 1860. Always outspoken, Stanton made no concealment of his

violent opposition to slavery, and Lincoln confidently made him Secretary of War, although he and Stanton were hardly friends. Stanton showed a genius for administration and for sure, rapid judgments, which made his conduct of his office extremely efficient. To him, almost as much as to Lincoln, and surely as much as to any general in the war, the successful outcome of the struggle may be attributed.

Stanton's blunt statements, his tactlessness, and his pitiless judgments made many enemies. Lincoln overlooked his faults, but after Johnson became President, the two clashed incessantly over reconstruction issues. It was because Johnson tried to remove his Secretary from office that the former was impeached. After the President's acquittal, Stanton resigned. President Grant appointed him Associate Justice of the Supreme Court, but a few days after the appointment, Stanton died, worn out from overwork, an old man at fifty-five.

Related Subjects. The reader is referred to the article JOHNSON, ANDREW, for details of the struggle between him and Stanton. See, also, TENURE OF OFFICE ACT.

STANTON, ELIZABETH CADY (1815-1902), an American reformer, a pioneer in the cause of woman suffrage, was born at Johnstown, N. Y. She was graduated from Emma Willard Seminary, in Troy, N. Y., and in 1840 was married to Henry B. Stanton, a man prominent in the anti-slavery agitation. While visiting in London, she met Lucretia Mott, and it was largely through her influence that Mrs. Stanton decided to call a woman's rights convention at her home in Seneca Falls, in 1848. This began her active public career, during the course of which she constantly championed equal rights for the two sexes; that is, more specifically, she worked for more intelligent divorce laws, for equal rights of property, and for suffrage and equal educational advantages. She was the

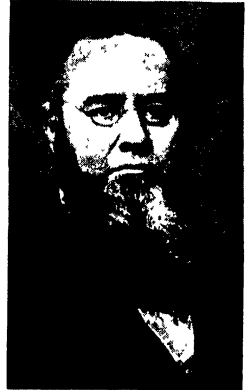


Photo: Brown Bros.

EDWIN M. STANTON



Photo: Brown Bros.

ELIZABETH CADY STANTON

first president of the National Woman's Suffrage Association, serving from 1865 to 1893.

Mrs. Stanton's lecture tours included the United States, Canada, England, France, and Scotland. In 1888 she presided over the first International Council of Women, in Washington. She was one of the founders, and for a time the editor, of *The Revolution*, a reform periodical. A prominent feature of her life was the attention she gave to the duties of her own home, and her skill in avoiding any conflict of public work with domestic life. Some of the reforms she agitated are still unachieved, but during her lifetime she witnessed great improvement in the status of women.

In Literature. Her writings embrace her autobiography, entitled *Eighty Years and More*, and *A History of Woman Suffrage*, of which she was joint author with Susan B. Anthony and Mathilda Joslyn Gage.

Related Subjects. In the group of social and political reformers of the period of Mrs. Stanton's activity were such devoted women as SUSAN B. ANTHONY, MARY A. LIVERMORE, BELVA LOCKWOOD, LUCRETIA MOTT, DR. ANNA SHAW, and FRANCES WILLARD. Their biographies will be found in these volumes in their alphabetical order. See, also, WOMAN SUFFRAGE.

STANTON, FRANK LEBBY (1857-1927), a journalist and poet whose negro songs and verse of the Southern United States were very popular. From his early youth, Stanton was in the field of journalism. He was born in Charleston, S. C. After receiving a common-school education, he served an apprenticeship as a printer, and at one time was employed as an office boy by Joel Chand-



FRANK L. STANTON

ler Harris, one of the South's most delightful writers.

Stanton early became associated with the press of Atlanta, Ga.; his column in the *Atlanta Constitution* he called "News from Billville." The charm, simplicity, and optimism of his work were unique. If measured by the opinion of newspapers and critics, the writings of few recent American poets have been more popular, both in the United States and Canada. He was made poet laureate of Georgia in 1925. He used a charming negro dialect in many of his poems and songs, and his pictures are true to the old-time negro life. Several of his poems will live long in the hearts of all music-lovers, such as *Mighty Lak' a Rose*, *Li'l Feller*, and *Just A-Wearyin' for You*. Some of his poems were set to music by Carrie Jacobs Bond.

Collected Writings. Among the volumes of Stanton's verse are *Songs of the Soil*, *Songs from Dixie*, *Up from Georgia*, and *Little Folks Down South*.

One Country, an outburst of patriotism, begins as follows:

After all,
One country, brethren! We must rise or fall
With the Supreme Republic. We must be
The makers of her immortality—
Her freedom, fame,
Her glory or her shame:
Liegemen to God and fathers of the free!

After all—
Hark! from the heights the clear, strong clarion call
And the command imperious: "Stand forth,
Sons of the South and brothers of the North!
Stand forth and be
As one on soil and sea—
Your country's honor more than empire's worth."

STAPES, *sta' peez*, one of three tiny bones in the cavity of the middle ear. See EAR (The Middle Ear).

STAPHYLOCOCCI, *staf e lo kok' se*, those bacteria that are arranged in rows. See BACTERIA AND BACTERIOLOGY; BOIL.



STAR. "The night has a thousand eyes, the day but one." So runs the familiar poem, referring to the stars that shed their radiance at night, and the sun that gives us the light of day. The sun is so near us, as nearness is reckoned in the infinitude of space, that it seems to be the biggest and brightest object in the heavens. If we could view it from a

distant vantage point in space, we should see it as a tiny speck in the universe. It is a true star, consisting of hot gaseous matter and shining by its own light, but there are millions of stars of greater size and brilliance; it is their remote distance that makes them seem mere points of light in the vault of heaven. Stars are composed of elements found also in the

composition of the earth, and in its early history our planet may have been a small luminous star, torn out of the body of the parent sun. Most astronomers believe that stars take their origin in the condensing of nebulous matter (see NEBULA).

Stars in Space. Our sun and its attendant planets are situated in a local star cluster somewhat north of the median plane of the greater system we call our stellar universe. The shape of this vast aggregation of stars is believed to be approximately that of a watch or grindstone. As the human mind pictures it, the stars are arranged between the two flat surfaces. Astronomers have tried to calculate the dimensions of this huge system, and estimates run from 30,000 light years to 300,000 light years for the length of the equatorial diameter, but the latter figure is nearer the ones generally accepted. (A light year is the distance light travels in one year, at the approximate rate of 186,300 miles per second.) The distance through the shorter diameter (from the back of the "watch" to the face) is thought to be one-twentieth to one-tenth that of the longer diameter.

Visible across the sky on a clear night is the beautiful band of silvery light called the Milky Way. The Milky Way is regarded by practically all astronomers as the fundamental, central plane of our stellar universe. What we actually see is the projection on the sky of the stars in the direction of this plane. So numerous are they in this central region, and so great is the distance from center to periphery, that the eye sees only a hazy wreath of light. The telescope, however, resolves the Milky Way into millions of radiant stars, the most sublime of all spectacles projected on the celestial sphere. When we look toward the Milky Way, we are viewing the stars in the direction of the far-extended equatorial diameter of our disc-shaped system. The less crowded portions of the sky represent those regions in the direction of the shorter diameter, at right angles to the plane. The Milky Way is also known as the Galaxy, but this name is applied by some astronomers to the stellar system as a whole.

[The reader is referred to full-page illustration of the Milky Way, on page 471.]

Varying estimates have been made of the number of stars in our system. In the northern hemisphere, on a clear night, the largest number visible to the naked eye at one time is from 2,000 to 3,000. But the largest telescope in the world, the 100-inch reflector of the Carnegie Observatory on Mount Wilson (near Pasadena, Calif.), can photograph about one billion stars. It is known that there are a great many dark stars, and stars so far away that neither the telescope nor the camera can

reach them. The total number of stars has been estimated at from thirty to forty billion.

The imagination recoils from attempts to visualize the spaces that separate these heavenly bodies. Light, the fastest traveler in space, must journey over four years from the star group nearest us—the double star Alpha Centauri and a dwarf companion—before that light is visible to us. On the remote edges of our system are stars that lie thousands upon thousands of light years away. This fascinating subject is further treated in the article ASTRONOMY (Distances That Defy the Imagination).

External Stellar Systems. Thus far, we have been considering the stellar system of which our solar system is such a minute portion. Incredible as it may seem, it is believed by most astronomers that far out in the realms of space lie other stellar systems, some of them perhaps larger than our own. One of these in particular has been eagerly studied. When projected on the sky, it appears to have a diameter about six times that of the moon, and so can be seen without a telescope. This is the great spiral Nebula of Andromeda, which the eye sees as a misty cloud of light. It is known to be about 1,000,000 light years away. Its spiral shape is readily seen in photographs, and it has been suggested that, if there are worlds such as ours in this far-off universe, intelligent beings may be taking similar photographs of our own system. Our Milky Way is probably a spiral rather than the wreath it seems to be. Not visible to the naked eye, but revealed by the telescope, are hundreds of thousands of these "island universes," some appearing as ovals, some edge-on, some as spheroids. The fainter ones are supposed to be 140,000,000 light years away. There is another type of external stellar group that is also being studied. This is the star cloud, represented by the Magellanic Clouds of the southern sky. These star clouds also are outside our system.

Star Movements. We are accustomed to speak of the "fixed" stars and the "wandering" planets, but it is the immense spaces that lie between us and the stars that make them seem motionless to the casual observer. All of them, including our sun, are in reality journeying onward through space. Our sun is traveling in the general direction of the star Vega, or, more accurately, toward a point in the constellation of Hercules, at the rate of about twelve miles per second; and many other stars are speeding on at higher velocities. From the observed phenomena, astronomers are agreed that these movements are not entirely at random, but, like the motions of bees in a swarm, combine the random motion of individuals with forward motions of groups. The stars within range of measurements are known to be grouped into two main streams,

moving in opposite directions. It has been suggested that these star streams represent the two arms of a vast spiral, curving from opposite sides of a nucleus. It is believed that these facts point to a stellar system not yet in what physicists call *dynamic stability*. For untold millions of years to come, it is conjectured, the stars will continue to travel about in their courses, until the system reaches a stage of equilibrium, with the stars symmetrically distributed.

To the non-professional observer, of course, these movements are not apparent. So vast are the distances in space that the forms of the constellations and the general picture of the sky seem to remain unchanged through a lifetime, and even for centuries. Astronomers, however, have ways of detecting the proper motion of the stars, by which we mean their displacements in various directions on the dome of the sky. For instance, changes in relative positions can be noted by comparisons of positions measured at long intervals, either visually or photographically. All of these changes are real, but are not sufficiently large to have materially changed the sky pattern within the period of astronomical observation. Uncounted ages from now, however, the Dipper and many other conformations familiar to us will have disappeared. The displacements that astronomers detect are relative, of course, because these scientists must make their observations from an earth that is itself being carried through space with the rest of the solar system.

Besides these movements, the stars have certain apparent changes of position that anyone can observe for himself. Like the sun, the stars rise and set, for the earth's rotation on its axis, once in twenty-four hours, gives the dome of the heavens an apparent movement westward of about 15° an hour. A star observed near the eastern horizon early in the evening will have traveled apparently far toward the west, several hours later. Since the whole sky seems to be turning, the observed star's position relative to some other star or constellation will remain unchanged. Then there is the apparent motion of the stars caused by the revolution of the earth in its orbit. Because of this movement, the heavens seem to change from month to month, but the stars are always back at the end of the year in the positions observed twelve months before (see, in the *ASTRONOMY* article, full-page charts of the heavens in the four seasons).

Besides moving onward in space, some stars are revolving in pairs around a common center of gravity, forming *binary systems* (see *DOUBLE STARS*). Thousands of such systems have been discovered, as well as numerous triple and multiple systems, in which a binary group revolves about a third star, or each component

of the binary has its own companion star. These stars are held together by gravitational force.

Grouping and Naming of Stars. The constellations mentioned in the preceding section are natural groupings of stars that bear names given them by the ancients. The names are mostly drawn from mythology, and were applied because of some real or fancied resemblance to men, animals, or objects, or were chosen arbitrarily. This division of the sky into star groups was a considerable aid in the identification of stellar positions at a time when astronomy was young, and is still a serviceable guide to star locations. In many cases, a star's name is that of the constellation in which it appears, plus a Greek letter; thus, Alpha Centauri is the brightest star in Centaurus. Other stars are known by a combination of constellation and number. But the great majority of stars that have any designation at all are known only as a number in some catalog. The catalogs sometimes contain hundreds of thousands of stars. The subject of grouping and naming is further treated in the article *ASTRONOMY* (The Stars and Their Names).

Magnitude. In respect to the degrees of brightness with which they shine, stars are divided into *magnitudes*. Each magnitude is about two and one-half times brighter than the magnitude next below it. The human eye cannot discern stars fainter than the sixth magnitude, but those of the twentieth magnitude, and even fainter ones, are revealed through the largest telescopes. Stars of the first magnitude shine one hundred times as brightly as those of the sixth, and their light is a million times as intense as those of the sixteenth. While all the bright stars are popularly called of the first magnitude, the astronomer has adopted a scale such that a star like Altair or Aldebaran is of standard first magnitude, and the magnitudes of stars brighter than these are expressed by decimals and negative numbers. Thus Sirius is of magnitude -1.6 ; and Capella $+0.1$.

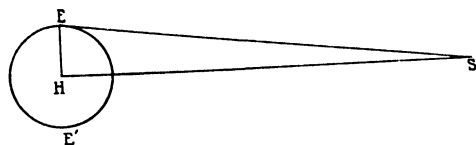
From the days of the Greek astronomer Hipparchus, in the second century B.C., catalogs of stars have been compiled from time to time. The table on the following page gives the results of recent investigations on the numbers of the stars of different magnitudes; but as estimates are being constantly revised, it must be considered subject to change.

Among the stars of first magnitude, or brighter, are Sirius, Canopus, Alpha Centauri, Vega, Capella, Arcturus, Rigel, Procyon, Alpha Eridani, Beta Centauri, and Altair. Of these, some are very much brighter than the first magnitude. For example, Sirius is 2.5 magnitudes brighter than a standard first-magnitude star, such as Altair.

Total number of stars to magnitude	0.0	2
" " " " " "	1.0	11
" " " " " "	2.0	39
" " " " " "	3.0	140
" " " " " "	4.0	500
" " " " " "	5.0	1,600
" " " " " "	6.0	4,800
" " " " " "	7.0	14,000
" " " " " "	8.0	40,000
" " " " " "	9.0	120,000
" " " " " "	10.0	320,000
" " " " " "	11.0	870,000
" " " " " "	12.0	2,300,000
" " " " " "	13.0	5,700,000
" " " " " "	14.0	14,000,000
" " " " " "	15.0	32,000,000
" " " " " "	16.0	70,000,000
" " " " " "	17.0	150,000,000
" " " " " "	18.0	300,000,000
" " " " " "	19.0	550,000,000
" " " " " "	20.0	1,000,000,000

Distances and Diameters. The measurements of star distances and diameters are among the most significant achievements of modern astronomy. The first important step in measuring distances was accomplished by Friedrich Bessel in 1838, when he computed the annual parallax of the star 61 Cygni. By this method, the position of a star is observed with reference to near-by stars, and six months later its position is observed again, the earth in that time having traveled over half of its orbit round the sun. The angle subtended by these two sight lines is twice the parallax of the star, and is the basis for figuring its distance (see PARALLAX; ASTRONOMY). This method is limited to the nearer stars, for the subtended angles for most of the stars are too minute to be measured, even with the most delicate instruments. The following paragraph makes this clear.

How Star Distances May Be Determined. If, as indicated in the diagram, the position of a star (S) be measured when the earth is at



HOW STAR DISTANCES ARE DETERMINED

the position E, of its orbit, the measurement will be affected by the parallax, $\angle ESH$, of the star; and if, six months later, when the earth has reached the position E' of its orbit, the position be measured again, the difference between the two measures will be twice the parallax. From the parallax, the distance is obtained by a simple formula. Since the distance HS is very great compared with the known base line HE , about 275,000 times as large for the nearest fixed star, the angle $\angle ESH$ is very small, and therefore very difficult to

measure accurately. The distance HE , from sun to earth, is 93,000,000 miles.

It is, of course, impossible to have the triangle ESH represented accurately as to scale. To represent the distance HS accurately in relation to the distance HE would require the line HS to be nearly two miles long, if HE is one-half inch.

The next step was determination of distances by use of the spectroscope (which see). By a method recently perfected, which is too complicated to explain here, the distance of a star of known apparent brightness can be calculated from estimates of the relative intensities of certain lines in its spectrum. Already the distances of more than 2,000 stars have been determined by the spectroscopic method. Another method, having the advantage of being applicable to the extremely remote stars, is explained in the section on *Variable Stars*, below.

Equally astounding is the progress made in measuring star diameters. So remote are the stars that through the largest telescopes they appear as points of light, not as discs, and direct measurements of their diameters were impossible until the invention of the interferometer, by Professor Michelson of the University of Chicago. By the interferometer method, a plate containing two parallel slits is placed over the end of the telescope, resulting in the projection of a star image crossed by light and dark bars. The bars disappear as the slits are separated, and there is a direct relation between the diameter and distance of the star and the amount of separation needed to bring about this disappearance. The beam interferometer is a more powerful instrument which enables the observer to measure even smaller angles than the ordinary interferometer. The first star diameter determined by this method was that of Betelgeuse, measured at the Carnegie Observatory on Mount Wilson. The four largest stars, and their diameters in miles, are given in the following table:

Antares (Alpha Scorpii).....	400,000,000
Alpha Herculis.....	350,000,000
Mira (Omicron Ceti).....	250,000,000
Betelgeuse (Alpha Orionis).....	235,000,000

The parallaxes of Mira and Alpha Herculis are uncertain, so their diameters are regarded as not so well determined as those of Antares and Betelgeuse. How lost in one of these huge bodies would our sun be, with its diameter of 864,000 miles!

Variable Stars. Stars which appear to change their brightness, either slowly, regularly, or continually, are called variable. They may blaze out suddenly and disappear, grow bright and dull alternately, or slowly fade. The periodical darkening of some stars is attributed to an eclipse by some intervening opaque body. Algol is the most famous star of this class (see ALGOL). Certain short-period variables, called *Cepheids* from the variable star Delta in the constellation Cepheus, have provided astronomers with a remarkably accurate gauge for measuring star distances. There is a fixed relationship between the absolute magnitude and length of period for these stars. When the period has been determined, the absolute magnitude can be deduced. The apparent magnitude is easily known, and the distance of the star can be calculated from the simple relation between the absolute and apparent magnitudes. It was from the observance of Cepheid variables in the Nebula of Andromeda that the remote distance of that star system was ascertained. The cause of the periods in Cepheid variables has puzzled astronomers, since the eclipse theory does not explain the observed phenomena in their case. An hypothesis regarded favorably by some scientists attributes their variation to periodic pulsations of the gaseous interior, causing changes in the rate at which the light is emitted.

Another interesting type of variable is the *nova*, or new star. A nova is a star that blazes out suddenly with great brilliance, after which it fades rapidly, then more slowly, to a fairly uniform dimness, or dies out altogether. Such stars are not to be regarded as newly created stars, but as faint stars that have suddenly increased greatly in brightness. The appearance of these novae has been attributed to collisions between two stars, and also to the passage of a dim or non-luminous star through a stream of meteorites which might release sources of atomic energy. Because of the immense distances separating stars, star collisions must occur too infrequently to account for the number of novae observed.

Small fluctuations in the heat radiation from the sun have been established, connected to some extent with the sun-spot periodicity. Similar changes in the light of the sun are indicated, and the ultra-violet light has been

shown to have much greater changes. Thus the sun is the nearest variable star visible to us. The observation of variables is carried on largely by observatories, but their work is supplemented by that of amateur astronomers.

Types of Stars and Their Evolution. Stars are classified according to the kinds of light radiations they emit, as revealed by the spectroscope (which see). The hottest are white, and their spectra show the presence of hydrogen and helium. Yellowish stars, of which our sun is a type, are of average mass, density, and temperature. Red stars are of still lower temperature and are of two kinds: namely, huge tenuous masses, such as Betelgeuse and Antares, supposedly in an early stage of evolution, and small, denser stars nearing the time of extinction.

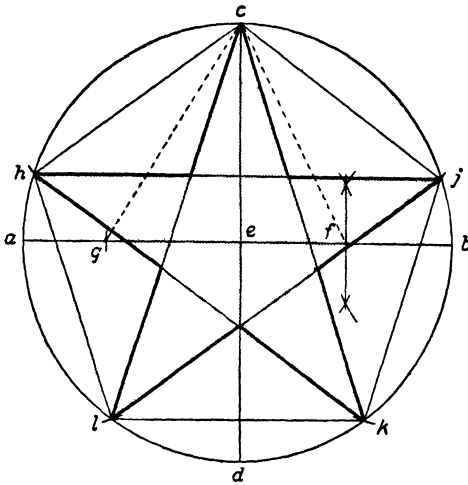
The spectral types of stars are now designated by the letters *O, B, A, F, G, K, M, R, N*, and *S*. *O* and *B* stars have spectra characteristic of helium and hydrogen, and thus are intensely hot white stars. Stars whose spectra range between *A* and *F* (the classes are not rigidly marked off from one another) are white or blue, and are dominantly of hydrogen composition. In the groups *F* to *G* and *G* to *K* are the yellow stars, and in these the metallic elements are found conspicuously. The red and coolest stars are in Class *M*, and the last stage is invisibility. According to an hypothesis strongly advocated in recent years, stars begin as Class *M*, and are then widely extended gaseous bodies of lowest possible density and of low temperature and luminosity. By a continuous process of contraction, they grow hotter and denser, but only those of largest mass generate enough heat to become *O* or *B* stars. After reaching a point of critical density, they reverse the evolutionary process and become *M* stars again, after which they attain solidity and extinction of brightness. Stars in the ascending line are known as *giants*, and those in stages of descent are called *dwarfs*. This hypothesis is very satisfactory in many respects, but fails to account for all the facts. A satisfactory theory will have to be more complicated.

Whatever the life history of a star, it is known that stars exist through billions of years. The extreme slowness of decline (loss of mass by contraction) is supposed to be due to the vast stores of energy existing in the interior atoms. This energy is probably released through the disintegration of the atoms under the influence of tremendous pressures and temperatures, and serves to replenish the energy of radiation.

Mariner's Stars. "Steering by the stars" has become a common expression, and sailors, by careful observation of the position of certain well-known stars, are able to verify the correctness of, or error in, the courses they are

steering. In the northern hemisphere, the familiar Dipper acts as guide to mariners and to hunters in the forests of the North. Two of its stars point to the North Star; that point ascertained, the other points of the compass are easily located. In the southern hemisphere, the Southern Cross serves the same purpose. Many a sailor, storm-tossed, his vessel driven miles out of its course, has been cheered and saved by a rift in the clouds which permits him a view of the Dipper or of the Southern Cross.

How to Make a Star. The accompanying diagram shows a geometrical drawing which may serve as a

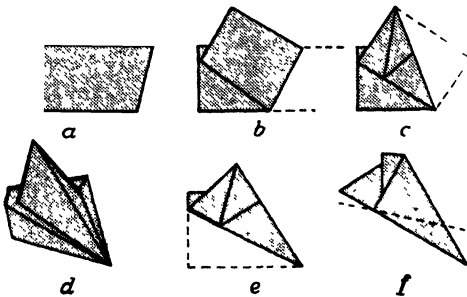


HOW TO MAKE A STAR

The figure is explained in the text.

pattern for a five-pointed star. The drawing can be constructed as follows:

Draw a four-inch circle. Draw the horizontal and vertical diameters $a b$ and $c d$. Mark the point of intersection e . Bisect $c b$ and mark the point of intersection f . With f as a center and $c f$ as a radius,



HOW A STAR MAY BE CUT FROM PAPER

describe an arc cutting $a e$, marking the point of intersection g . With $g c$ as a radius and c as a center, describe two arcs cutting the circumference at h and j . With h and j as centers and the same radius,

describe arcs cutting the circumference at k and l . Form a star by connecting c and l , c and h , h and j , and j and k .

The six drawings of the second diagram show how a star may be cut out quickly by folding. Cut on the dotted line in f , which shows the reverse of e .

These directions will be especially helpful to a class desiring to make a flag [see FLAG (How to Make a Flag)]. F.B.L.

Related Subjects. In addition to references included in this article, see list of related subjects at the close of the article ASTRONOMY.

STARBOARD. See SHIP.

STARCH, a soft, white, glistening powder, originating within the living cells of plants. It is especially abundant in wheat, rice, potatoes, and root foods such as arrowroot and sago. Starch is made up of hydrogen, carbon, and oxygen, and is therefore a carbohydrate. It is one of the most important foods known to man, and is an active producer of energy and heat in the body, through which it circulates in the form of grape sugar, a chemical change resulting from digestion. It is highly nutritious, but should be taken in combination with other foods (see FOOD).

The Plant as a Manufacturer of Starch. Starch-making is confined to those plants which contain a green coloring matter called *chlorophyll*, and takes place only under the direct influence of sunlight, and when water and carbon dioxide are both present. Just how the chlorophyll bodies use the water and carbon dioxide to make starch is not known, for the process is understood by neither the chemist nor the botanist. Professor George L. Goodale of Harvard University has made the following interesting comparison between the starch-making leaf and any mill—for ease of comparison, a flour mill:

	THE MILL	LEAF CELLS
Raw Material:	Wheat	Carbon dioxide, water
Energy:	Steam, electrical, or water power	Sunlight
Manufactured product:	Flour	Starch
By-product:	Bran, etc.	Oxygen

Characteristics. Under the microscope, many starches are seen to consist of minute, oval, or pear-shaped grains, each of which contains a central portion, or hilum, and a series of envelopes, arranged about the nucleus and having a common center. Starches from many plants, such as rice, corn, and potato, have each a very characteristic appearance under the microscope. This fact is often of service in the detection of adulteration in food products. For example, an expert microscopist can easily tell if arrowroot (an expensive starch) has been adulterated with potato starch (a cheap starch). Starch will not dissolve in water, alcohol, or ether, but in boiling water

the grains swell and break up, forming a stiff paste, when cooled.

An infallible test for starch is the addition of tincture of iodine to the starch paste, which produces a deep-blue color. This color disappears if heat is applied. The iodine test is useful in determining the presence of starch in foodstuffs. If starch is heated dry, it will change to a yellowish substance called *dextrin*. The starch in bread dough is by fermentation converted into *dextrose*, which is further changed into alcohol and carbon dioxide, the formation of which gas causes the bread to "rise."

How Starch Is Prepared for Use. Starches are divided into two general groups—those used for food and those used in laundering, in the finishing of certain textiles, and as a thickening material in calico printing. Some starches come under both groups. Starch is also used indirectly in the preparation of dextrin and starch sugar, potato starch being the principal variety employed for this purpose.

Cornstarch, widely known and used, is the starch of Indian corn, or maize. The starch is first separated from the grain by steeping for a long time in water; it is then crushed between cylinders, and strained through a sieve. The milky fluid containing the starch grains is allowed to flow over a series of surfaces having a slight inclination, and in this process the heavier grains are deposited, while the lighter particles are carried into settling tanks. The deposit in the tanks is purified by a series of strainings and settling, the final product being dried by artificial heat until it forms the fine white flour sold as cornstarch.

Wheat, rice, and potatoes are extensively used in making starches for industrial purposes, rice starch being preferred for use in the laundry. Wheat starch is separated from the grain by two methods—fermentation and a mechanical process. In the former process, whole wheat or wheaten meal is soaked in water for the purpose of softening the wheat grains and causing them to swell. The grains are then reduced to a pulp, and a thick fluid is formed by mixing the pulp with water. The mixture is then placed in tanks and subjected to fermentation, after which the starch is separated in a washing drum, and purified by repeated washing and settling, being finally dried by gentle heat.

By the mechanical process, a stiff paste is made by kneading wheaten flour. This is washed over a fine sieve, in the course of which the starch is separated from the gluten, the latter remaining in the sieve as an elastic, sticky mass. The starch is then purified and dried. The gluten mass is utilized in various ways, notably as a food for patients suffering with diabetes, and as an ingredient of macaroni.

Potato starch is made by steeping and washing the potatoes, and then rasping them down to a fine pulp, which is deposited in water in the form of raw starch. The starch is washed over fine sieves so that the impurities and pure starch may be separated; only the latter passes through the meshes of the sieve. Potato starch is widely used as an adulterant and as a substitute for the pure food starches. G.M.S.

Related Subjects. The reader is referred in these volumes to the following articles:

Arrowroot	Chlorophyll	Digestion	Tapioca
Carbohydrates	Dextrin	Sago	Yeast

STAR CHAMBER, an old English tribunal which met at Westminster and which is said to have taken its name from a room where the meetings were held, which was decorated with gilt stars. It is supposed to have originated in the ancient exercise of judicial functions by the king's council. Until the fifteenth century, little is known of it, but in 1487 Henry VII reorganized it and gave it new powers, or, according to another theory, inaugurated a totally new court. His statute gave to a commission, composed of a chancellor, treasurer, keeper of the privy seal, chief justices, or, in their absence, two other justices, a bishop, and a temporal lord, the right to act as a court of trial for all misdemeanors of sheriffs or of jurors, and for all riots or unlawful assemblies. The trials were without jury, and any sentences short of death might be passed.

During the time of the Tudors, this court, arbitrary as it was, was of real service in reducing to order the great nobles, who, when brought before any ordinary court, often succeeded in intimidating the jury. Many abuses crept into its proceedings in the course of time, however, chief among them being the custom of forcing prisoners by torture to confess. Under James I and Charles I, the hatred felt against the Star Chamber greatly increased, and in 1641 the Long Parliament abolished it.

Modern Application. The term *star chamber* is used to-day to designate secret meetings of officials or politicians in which plans are laid for their personal aggrandizement, rather than for the public good; or, by extension, to designate any secret session of unusual character.

STARFISH, one of a class of sea animals having the general appearance of a star or of a pentagon. The typical starfish has five arms radiating from a flattened, central disc, but in some species there are many more projections, the number ranging from five to forty. Usually, the arms are not so sharply marked off from the disc as in the related class, the brittle stars. Starfishes are not fish in the scientific sense of the term. They constitute the class *Asteroidea* in the major division, or phylum, *Echinodermata* (see ECHINODERMS), which includes brittle stars, sea urchins, sea

lilies, and sea cucumbers. These are the spiny-skinned creatures of the animal world.

The skin of the starfish is beset with limy spines arising from skeletal plates developed just under the skin. On the under surface of the disc is a mouth, and on the same surface of each arm there is a groove beginning at the mouth and ending near the tip of the arm. From rows of tiny holes in these grooves the starfish can push out slender, glassy tubes, or "feet."

These tubes exert a suction on surfaces and enable the animal to crawl. At the tip of each arm there is one small pigment spot, often called an eye, protected by a circle of spines. Starfish have remarkable powers of renewal. If a starfish loses an arm, it grows another one. If the animal is cut in two, each of the pieces develops into a new individual.

Asteroids are found in all parts of the world except the Polar regions. There are no edible species, though the related sea cucumbers are prized as food in the Orient. Starfish have a well-developed digestive system, and subsist chiefly on oysters, mussels, clams, and snails. Nearly all of the central disc is occupied by a bag-like stomach, into which the mouth opens. Folds of the stomach extend out into the arms. To reach the soft body of an oyster, the starfish forces open the valves of the victim's shell by pulling upon them with its tube feet. The oyster can withstand the strain for a time, but finally its muscles must relax. When the shell drops open, the starfish ejects its stomach through its mouth opening, turning the organ inside out and applying it to the soft body of its victim. Digestion and absorption then take place. In the North Atlantic, the common starfish causes serious losses by preying on the oyster beds.

S.H.S.

STAR GRASS. See illustration, page 241.

STARK, JOHN (1728-1822), an American military leader, conspicuous in the Revolutionary War. Stark was a true patriot, for in 1776 he pledged his fortune to the soldiers, to induce them to reenlist. He was born in Londonderry, N. H., and while a boy was captured by the Indians, who styled him "the young chief." He fought in the French and Indian War, and at the beginning of the Revolution was appointed colonel. He was with Washington at

Trenton and Princeton, then retired temporarily from service. Called again to take command of the New Hampshire troops, at Bennington, in August, 1777, Stark attacked the enemy with the order—"There they are, boys. We beat them to-day or Mollie Stark's a widow!" In this battle, the enemy was defeated, and the victory paved the way for the surrender of Burgoyne at Saratoga. Stark was rewarded by thanks from Congress and

the rank of brigadier general, conferred in October, 1777. In the following year, and again in 1781, he commanded the Northern Department; he was brevetted major general in 1783.

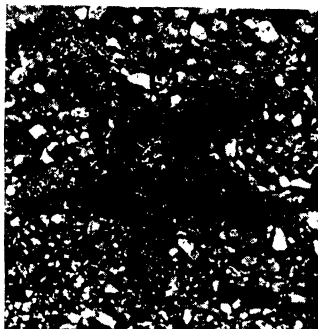
In 1894 New Hampshire presented his statue to the government for erection in Statuary Hall (which see).

STARLING, a song bird common throughout the Old World. It is black in color, glossed with greenish purple, or lilac, and has its feathers tipped with buff. The *common starling* is a favorite bird in England, where it is resident for most of the year, retiring only in the coldest weather to Southern Europe or to North Africa. It is seen in large flocks even during the nesting season,

and is invaluable to farmers on account of the numbers of insects it devours; in the fruit season, however, it eats so many berries, cherries, and even apples and pears, that it is considered somewhat of a pest at that time. It nests about buildings, in hollow trees and bird houses, or in holes in cliffs. The eggs are four to seven in number, and a light greenish-blue in color.

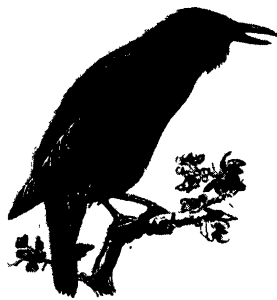
About sixty common starlings were liberated in Central Park, New York, in 1890, and they have spread through many states in the eastern part of the country. The introduction of the starling is thought by some to have been a mistake, as it is a quarrelsome bird.

D.L.



Photos: Visual Education Service; St. Clair

ST FISH



THE STARLING

Scientific Name. Starlings constitute the family *Sturnidae*. The common English starling is *Sturnus vulgaris*.

STAR OF BETHLEHEM, a small, hardy plant of the lily family, the flowers of which have the form of a six-pointed star. The petal-like sepals are white, but have green stripes on the outside, a color scheme repeated in the leaves, which are green with white stripes. The star of Bethlehem is a native of Italy, but has become a common garden plant in America. The flower stalk springs from a coated bulb (which see). B.M.D.

Scientific Name. The star of Bethlehem belongs to the family, *Liliaceae*. Its botanical name is *Ornithogalum umbellatum*.

STAR OF THE SOUTH. See DIAMOND (Famous Diamonds).

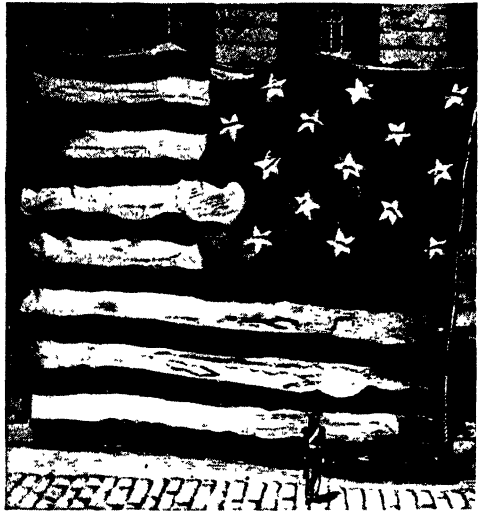
STARR, ELLEN GATES. See ADDAMS, JANE; HULL HOUSE; SOCIAL SETTLEMENT.

STAR ROUTES, a name given to designated routes over which mail is carried in the United States when train or steamship transportation is not available. Private contracts are made with messengers; these contracts do not specify the means of carriage, but require for the service "celerity, certainty, and security," indicated by three stars on the registers of the Postoffice Department. The messenger receives the mail in bulk from the train or boat, and carries it to the postoffice which he serves, on foot, on horseback, by wagon, auto, or any means consistent with the three specifications. From there it is distributed to the proper addresses. The service is especially advantageous to people who live in districts remote from railroads. Free-delivery routes and ordinary routes over railroads or by steamboat are not called star routes. There are still many star routes in the United States, but, with the extension of railroad facilities, they are constantly decreasing in number and in importance.

Star Route Frauds. This term was applied to irregularities in the postal service on star routes, discovered in the last days of the administration of President Hayes. Fraudulent petitions were forwarded to the postoffice authorities in Washington, urging the creation of new star routes and furnishing "estimates" for carrying the mails over them at prices far above the necessary cost of the service. These estimates were allowed, and the money fraudulently derived therefrom was divided among the parties to the plot. The guilty parties were finally exposed, and the conspiracy was broken up in the administration of President Garfield. It is estimated that the plot, if successful, would have defrauded the government of half a million dollars a year. T. J. Brady, Second Assistant Postmaster-General, and S. W. Dorsey, a Senator from Arkansas, were tried for complicity, but were acquitted. William P. Kellogg, a Senator from Louisiana, was also indicted, but his case was not tried.

STAR-SPANGLED BANNER, THE, an American patriotic song, written by Francis Scott Key, and sung or played to an air composed by John Stafford Smith. Army and navy regulations provide that it shall be designated as the national air of the United States. Several Presidents have approved the choice, but Congress has never crystallized this favorable sentiment into a statute.

How the Song Came to Be Written. After the burning of Washington, D. C., by the British soldiers, in August, 1814, Dr. William



"THE STAR-SPANGLED BANNER"

The illustration is a drawing of the original flag which floated over Fort McHenry.

Beanes of Upper Marlborough, Md., threw three British refugees into jail, and for this he was arrested by the English forces and taken as a captive aboard a warship in Chesapeake Bay. John S. Skinner of Washington, and Key, then a young attorney in the District of Columbia, were granted permission by Secretary of State James Monroe to intercede for the doctor, and these two boarded the vessel just as it was preparing to bombard Fort McHenry, the chief protection of Baltimore. The British officers agreed to release Beanes, but refused to allow the two Americans to leave the vessel until after the battle, lest they should tell the plans to the patriots on land.

On Tuesday, September 13, 1814, the bombardment began, continuing that day and almost all night. To Key and his companions, it seemed impossible that the fort could survive the attack, as its guns were small and its defenders were few. All night they walked the deck in anguish, and even when dawn came could not discover the outcome, because of haze



Birth of the American Flag. Scene in the Betsy Ross house in Philadelphia, as pictured by the artist, H. Mosler.

and smoke. Suddenly, at seven o'clock, a rift in the mist showed, for a moment, the flag gleaming over the walls. Thrilled by the sight, Key wrote the greater part of the poem in a few minutes on the back of an unfinished letter, and completed the stanzas that night in a Baltimore hotel.

The next morning, the poem was printed on handbills, and during that day Key's brother-in-law suggested that it be set to the old English drinking tune, *Anacreon in Heaven*, which was already familiar to Americans as the air for a political song entitled *Adams and Liberty*. A few days later, an actor named Ferdinand Durang first sang it in public at Baltimore. The composition immediately became popular, was played at the Battle of New Orleans, and is now played each evening at flag-lowering in every American fort and garrison, and on every American battleship throughout the world. The words of the song appear on this page.

The United States government keeps a flag floating continually over Key's grave at Frederick, Md., while, on the other side of the continent, a great statue in memory of him, the gift of James Lick, looks out upon the Pacific from Golden Gate Park, San Francisco.

On September 13, 1914, the city of Baltimore celebrated with an appropriate program the hundredth anniversary of the writing of the song.

Related Subjects. The reader is referred in these volumes to the following articles:

Baltimore (History)
Hymns, National

Key, Francis Scott
War of 1812 (Story)

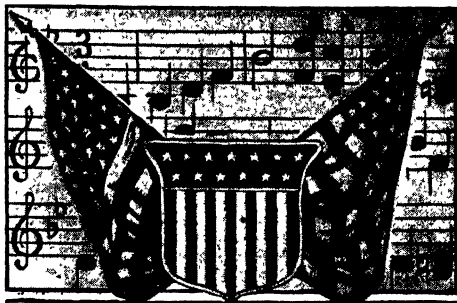
STARVATION. See FASTS AND FASTING.

STARVED ROCK. See LA SALLE, RENÉ ROBERT CAVELIER; ILLINOIS (Physical Features).

STATE, a group of persons who are permanently located within a definite territory, wholly independent of any outside control, living under an organized government which is their supreme authority, and to which all render allegiance. The ancient idea of the state was that of a system of tyranny, instituted for the purpose of forcing an unwilling service upon the people. The modern idea is that of a system of service for the people, to give them the largest possible freedom and to carry out the will of the people, collectively expressed. Sir William Jones patriotically summarized the true meaning of the word, in his poem beginning—

What constitutes a state?
Not high-raised battlement, or labored mound,
Thick wall or moated gate;
Not cities fair, with spires and turrets crowned,
But men, high-minded men. . . .

In the United States, the word is used for the political subdivisions of the Union. The name was originally chosen for each of the



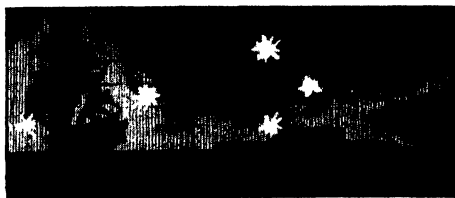
The Star-Spangled Banner

[The third stanza is omitted.]

Oh! say, can you see, by the dawn's early light,
What so proudly we hailed at the twilight's last gleaming?
Whose broad stripes and bright stars, thro' the perilous fight,
O'er the ramparts we watched were so gallantly streaming?
And the rockets' red glare, the bombs bursting in air,
Gave proof thro' the night that our flag was still there.
Oh! say, does the star-spangled banner still wave
O'er the land of the free and the home of the brave?

On the shore, dimly seen thro' the mist of the deep,
Where the foe's haughty host in dread silence reposes,
What is that which the breeze, o'er the towering steep,
As it fitfully blows, half conceals, half discloses?
Now it catches the gleam of the morning's first beam,
In full glory reflected, now shines on the stream;
'Tis the star-spangled banner. Oh! long may it wave
O'er the land of the free and the home of the brave!

Oh! thus be it ever when freemen shall stand
Between their loved homes and the war's desolation,
Blest with vict'ry and peace, may the heav'n-rescued land
Praise the Pow'r that hath made and preserved us a nation.
Then, conquer we must, when our cause it is just,
And this be our motto, "In God is our trust."
And the star-spangled banner in triumph shall wave
O'er the land of the free and the home of the brave.



OUTLINE ON THE STATE

I. Location

- (1) Latitude
- (2) Longitude
- (3) Boundaries
 - (a) Natural
 - (b) Artificial

II. Size

- (1) Length
- (2) Breadth
- (3) Area
 - (a) Actual
 - (b) Compared with that of provinces and other states

III. Physical Features

- (1) General surface facts
 - (a) Mountains or hills
 - (b) Plains
 - (c) Watersheds
- (2) Effects on climate
- (3) Drainage
 - (a) Rivers
 - (b) Lakes

IV. Climate

- (1) Conditions that might be expected, owing to latitude
- (2) Variations and their cause
- (3) Rainfall
- (4) Healthfulness or unhealthfulness

V. Resources and Industries

- (1) Minerals
 - (a) Varieties
 - (b) Location
 - (c) Rank among states
- (2) Agriculture
 - (a) Crops
 - (b) Stock-raising
 - (c) Dairying
 - (d) Rank among states
- (3) Fisheries
 - (a) Sea or inland
 - (b) Rank among states
- (4) Manufacturers
 - (a) Principal articles produced
 - (b) Rank among states

VI. Transportation and Commerce

- (1) Railways
- (2) Rivers and canals
- (3) Commercial centers
- (4) Value of trade

VII. The People

- (1) Population
- (2) Density
- (3) Race
 - (a) Native Americans
 - (b) Foreign-born
- (4) Rate of increase
- (5) Special characteristics

VIII. Government

- (1) Departments
 - (a) Executive
 - (b) Legislative
 - (c) Judicial
- (2) Special features
- (3) State institutions

IX. Education and Religion

- (1) Public-school system
- (2) Institutions of higher learning
- (3) Churches represented
 - (a) Dominant religion

X. History

- (1) Exploration
- (2) First settlements
- (3) Interesting events
- (4) Admission to Union
- (5) Recent progress

thirteen colonies, after they declared themselves independent of Great Britain, and before they had adopted a Federal Constitution. At that time, each state was an independent, sovereign power. When, by the adoption of a common Constitution, they formed the United States of America, each gave up its sovereignty in regard to matters which directly concerned all the commonwealths, and so ceased to be a state in the highest political sense. It retained state sovereignty in everything pertaining to its local affairs; the Federal government then represented the real state.

The Study of a State. Like any other geographic unit, the state is best studied with the aid of an outline. The one given herewith is applicable to all the states of the American Union, despite the differences of detail which must of necessity exist.

STATE, DEPARTMENT OF, one of the executive departments of the United States, established by act of Congress in 1789. Through this department the national government receives all communications from foreign countries, or from individual states of the Union. The business of the department is divided among a number of bureaus and divisions whose names indicate their functions: divisions of Latin-American Affairs; of Far-Eastern Affairs; of Western European Affairs; of Near-Eastern Affairs; of Mexican Affairs; of Eastern European Affairs; bureaus of appointments; of foreign intelligence; of foreign-trade adviser; of passport control; of indexes and archives and of translating; the consular bureau; and the diplomatic bureau. Besides the chiefs of these bureaus, the Secretary is aided by three assistant secretaries (salaries, \$9,000 a year), and a solicitor (salary, \$8,500), who is a general legal adviser. There is now an under-secretary at \$10,000 a year.

The Secretary of State, like all other Cabinet officers, receives a salary of \$15,000 a year, and is appointed by the President, to whom he is responsible and under whose direction he works. He has charge of negotiation of treaties and of all correspondence with foreign nations, and is responsible for the publication of treaties, laws, and other public documents, and for the preservation of the originals. He is official keeper or custodian of the Great Seal of the United States, which must be affixed to proclamations, warrants, and appointments by the President. He receives foreign ministers and ambassadors and presents them to the President, and he also prepares the credentials of American representatives abroad (see DIPLOMACY). Passports are issued under his authority.

These numerous duties, highest in importance in many respects in the government, make the head of the State Department logically the leader in the President's Cabinet.

The Secretary of State stands first in the line of succession to the Presidency in the event of the deaths or permanent disability of the President and Vice-President. Besides standing first in rank, the State Department is also the oldest, for it is merely a continuation, under another name, of the Department of Foreign Affairs, the first executive department established, in 1781, under the Articles of Confederation. The position of the Secretary of State, while frequently compared to that of the Premier of Great Britain, is not like it, because the Premier is a legislator as well as an executive, and is responsible through Parliament to the people, whereas the Secretary of State is responsible only to the President, and has no influence, except such as his personal prestige commands, over Congress.

As the chief officer next to the President, in the executive department of the United States, quite overshadowing the Vice-President, the Secretary of State has almost invariably been a man of outstanding ability, and in a few instances the Secretary has overshadowed the President who appointed him. E.D.F.

Related Subjects. The reader is referred to the following articles in these volumes:

Cabinet	Premier
Consul	President
Diplomacy	Presidential Succession Act

STATE BANKS. See BANKS AND BANKING, subhead.

STATE COLLEGE. See SOUTH CAROLINA (Education).

STATE COLLEGE FOR WOMEN. See FLORIDA (Education).

STATE FLAGS. See color plate, article UNITED STATES.

STATE FLOWERS. See FLOWERS, subtitle.

STATEN ISLAND, about five miles from the southern extremity of Manhattan Island, N. Y., was formerly the county of Richmond, but is now a part of Greater New York City. It constitutes the borough of Richmond. The island is triangular in shape, thirteen and one-half miles long, with a maximum width of eight miles, and covers an area of fifty-seven square miles. It is connected by ferry with Manhattan and Brooklyn, and by vehicular bridges, completed in 1928, with New Jersey. Fort Wadsworth and Fort Tompkins, on Staten Island, command the Narrows and once were able to defend New York harbor. The chief towns are New Brighton, West New Brighton, Port Richmond, Stapleton, Tompkinsville, Tottenville, and Saint George. In 1929 plans were made to construct a tunnel under the Narrows between Staten Island and Long Island, to connect with Brooklyn. Population, 1928, 150,700 (Federal estimate).

The island was bought by the Dutch West India Company in 1630 from the Indians, who received in exchange "some kettles, axes, hoes,

wampum, drilling awls, jew's-harps, and divers other small wares." See map in article NEW YORK CITY.

STATE POLICE. See POLICE, subhead.

STATES-GENERAL, a legislative assembly in France which existed from 1302 until 1789. The term is also applied to the present Dutch Parliament. The States-General of France was composed of representatives of the clergy, the nobility, and the common people, who constituted what was known as the Third Estate. Until the States-General of 1484, the representatives of the clergy and the nobility were summoned personally by the king, while the representatives of the Third Estate were elected by the people they represented. After 1484, however, the representatives of all three classes were elected by vote.

The States-General did not meet at regular intervals, but was called together by the king in times of emergency, whenever he needed advice or money or moral support. Direct power belonged exclusively to the king, but the influence and indirect power of the States-General were at times very great. By the year 1614, however, the power of this assembly had declined to almost nothing. When it was again summoned, in 1789, the representatives of the Third Estate, who had been growing very powerful, made the famous decision which led to the French Revolution (which see), that the members of the States-General should constitute a national assembly with full sovereign powers, to be known as the National Constituent Assembly.

The States-General of the Netherlands, an assembly in which each province had one representative and one vote, was in existence at The Hague from 1593 until 1796, when it, too, became a National Assembly. The present Dutch Parliament, however, bears the name States-General (*Staten Generaal*).

STATES OF THE CHURCH, a name applied to the Papal States (which see).

STATES' RIGHTS, in American political history, the theory that the several states, in uniting to form a central government, surrendered none of their sovereign powers. The question of states' rights was debated, at the very beginning of United States history, between the followers of Hamilton, who urged a strong central government, and the followers of Jefferson, who wished to maintain a loose federation of sovereign states; it remained an issue of importance until the War of Secession. Out of the doctrine of states' rights grew the doctrine of the right of secession; this was the extreme and logical assertion of the sovereignty of the Southern states. Their failure to uphold their claims resulted in the removal of the doctrine of states' rights as a political issue, but there is yet a degree of conflict over occasional attempts by Congress to pass laws to invest

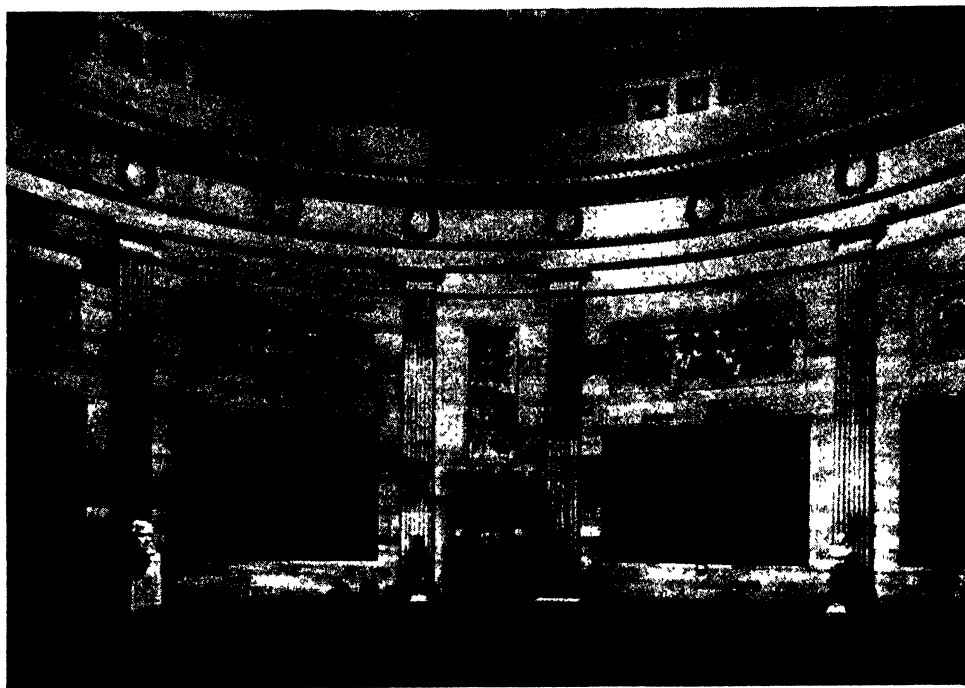


Photo: U & U

STATUARY HALL, BENEATH THE DOME OF THE CAPITOL

authority in the national government which many people believe should be reserved to the individual states. See WAR OF SECESSION (Direct Causes).

STATE UNIVERSITIES. See section on *Education*, in each state article.

STATIC, *stat' ik*. See ELECTRICITY (Electricity in Motion); RADIO COMMUNICATION (Glossary of Radio Terms).

STATICS, a branch of dynamics. Dynamics treats of the properties of matter and forces, and is divided into two branches—*statics* and *kinetics*. Statics deals with conditions under which there is no change of motion of material bodies when they are acted upon by various forces. When two or more forces so act upon a body as to produce no change of motion, they are said to be *in equilibrium*. A.L.F.

Related Subjects. The following articles in these volumes should be read in this connection:

Composition of Motions
and Forces

Force
Mechanics

STATOR, *sta' tor*. See DYNAMO.

STATUARY HALL, a large, circular room in the Capitol at Washington, on the main floor, directly beneath the great central dome of the building. Until 1857 it was the chamber of the House of Representatives. By act of Congress in 1864, it was created a memorial hall, to which each state may contribute two statues, to honor the men or women whom it

considers worthy of commemoration. The act reads as follows:

That the President be, and he is hereby, authorized to invite each and all the States to provide and furnish statues in marble or bronze, not exceeding two in number for each State, of men who have been citizens thereof and illustrious for their historic renown, or for distinguished civic or military services, such as each State shall determine to be worthy of this national commemoration; and that they be placed in the old hall of the House of Representatives in the Capitol of the United States, which is hereby set apart, or so much thereof as may be necessary, as a National Statuary Hall, for the purposes herein indicated.

In this hall the House of Representatives elected John Quincy Adams as President, in the momentous election of 1825; twenty-five years later, Fillmore took the oath of office on the day after Zachary Taylor died. Here Henry Clay, as Speaker, presided for many years over bitter debates on the War of 1812, on the Bank of the United States, and the tariff. Here Webster, Calhoun, Douglas, and Lincoln, among other great Americans, received their initiation into the nation's public life. These and other men discussed the issues which finally led to the War of Secession.

A list of the statues that have thus far been selected is given in the accompanying table. The only woman chosen is Frances E. Willard, whose statue was placed in the hall by Illinois, in 1905.

STATE	NAME	DATE PRESENTED	STATE	NAME	DATE PRESENTED
Alabama.....	J. L. M. Curry.....	1906	Missouri.....	Francis P. Blair.....	1890
Arkansas.....	Joseph Wheeler.....	1925	".....	Thomas H. Benton.....	1890
".....	Uriah M. Rose.....	1917	New Hampshire.....	John Stark.....	1894
Connecticut.....	James P. Clarke.....	1921	".....	Daniel Webster.....	1894
Florida.....	Roger Sherman.....	1872	New Jersey.....	Richard Stockton.....	1888
".....	Jonathan Trumbull.....	1872	".....	Philip Kearny.....	1888
Georgia.....	John W. Gorrie.....	1914	New York.....	Robert R. Livingston.....	1874
".....	Gen. E. Kirby Smith.....	1918	".....	George Clinton.....	1873
Idaho.....	Alexander H. Stephens.....	1926	North Carolina.....	Zebulon Baird Vance.....	1916
Illinois.....	Crawford W. Long.....	1926	Ohio.....	James A. Garfield.....	1885
Indiana.....	George L. Shoup.....	1909	".....	William Allen.....	1887
".....	James Shields.....	1893	Oklahoma.....	Sequoyah (George Guess).....	1917
Iowa.....	Frances E. Willard.....	1905	Pennsylvania.....	J. P. G. Muhlenberg.....	1889
".....	Oliver P. Morton.....	1899	".....	Robert Fulton.....	1881
Kansas.....	Lew Wallace.....	1909	Rhode Island.....	Nathanael Greene.....	1896
".....	James Harlan.....	1909	".....	Roger Williams.....	1870
Maine.....	Samuel J. Kirkwood.....	1913	South Carolina.....	John C. Calhoun.....	1909
Maryland.....	John J. Ingalls.....	1904	".....	Wade Hampton.....	1929
".....	George W. Glick.....	1914	Texas.....	Stephen F. Austin.....	1904
Massachusetts.....	William King.....	1877	".....	Samuel Houston.....	1904
Michigan.....	Charles Carroll.....	1901	Vermont.....	Ethan Allen.....	1875
Minnesota.....	John Hanson.....	1903	".....	Jacob Collamer.....	1879
Mississippi.....	Samuel Adams.....	1873	Virginia.....	George Washington.....	1908
".....	John Winthrop.....	1872	".....	Robert E. Lee.....	1908
".....	Lewis Cass.....	1889	West Virginia.....	John E. Kenna.....	1901
".....	Zachariah Chandler.....	1913	".....	Francis H. Pierpont.....	1903
".....	Henry Mower Rice.....	1916	Wisconsin.....	Jacques Marquette.....	1895
".....	Jefferson Davis.....	1929	".....	Robert M. La Follette.....	1929

STATUE OF LIBERTY. See **LIBERTY**, **STATUE OF**.

STATUTE, an enactment of an authorized lawmaking body. *Statute law* is another term for *written law*, and is to be distinguished from *unwritten*, or *common*, *law*. The bodies by which statute law is enacted are known variously as Congress, Parliament, Assembly, Legislature, etc. The ordinances of city boards of aldermen, or councils, are examples of local statute law, as are the regulations adopted by boards of health. These are also called *ordinances*. The nature of statute law and its relation to other forms of law are discussed in these volumes under the heading **LAW**. See **COMMON LAW**.

STATUTE OF LIMITATIONS. See **DEBT**.

STATUTORY LAW. See **LAW**.

STAUBBACH, *sh'toub' bahK*, **FALLS**. See **SWITZERLAND** (Waters).

STAUFEN, *sh'tow' fen*, **FREDERICK OF**. See **HOHENSTAUFEN**.

STAUNTON, **VA.** See **VIRGINIA** (back of map).

STAVANGER, *stah' vahng ur*. See **NORWAY** (The Cities).

STAYSAIL SCHOONER. See **YACHT AND YACHTING** (Types of Rigs).

STEAD, *sted*, **WILLIAM THOMAS** (1849-1912), an English journalist, born at Embleton. He received little schooling, but by dint of hard work made himself one of the world's notable men. When he was twenty-two years old, he became editor of a small paper, *The Northern Echo*, at Darlington, and was so successful that in 1880 he was offered the position of assistant editor of the *Pall Mall Gazette* in London, and three years later became its editor in chief. In that paper he began a campaign for laws to protect women and children from

outrages, and in 1885 wrote so bitterly of conditions in *The Maiden Tribute of Modern Babylon* that he was imprisoned in London for three months, for libel. However, he had the satisfaction that year of seeing the laws passed for which he had striven.

In 1890 he founded the *English Review of Reviews*, in 1891 the *American Review of Reviews*, and in 1894 the *Australasian Review of Reviews*. A visit to the czar of Russia in 1898 made him a zealous advocate of peace, and, subsequently, his weekly paper, *War Against War*, devoted largely to attacks on Great Britain's part in the Boer War, together with numerous pamphlets urging arbitration, did much to direct public sentiment toward world peace.

About 1905 Stead became a convert to spiritualism, and four years later published a statement that he was receiving daily messages from his dead son. Shortly before his death, he announced his intention of establishing in New York a spiritualistic station, much like a telephone central, where persons could deposit or receive communications connected with the other world. In pursuance of this plan, he sailed for the United States on the first voyage of the *Titanic*, and met his death when the vessel foundered off the Grand Banks, April 15, 1912, after striking an iceberg.

His Books. Stead was an author as well as a journalist, giving to the world *The Truth about Russia*, *A Study of Despairing Democracy*, and *The United States of Europe*. A book which created an immense amount of discussion was *If Christ Came to Chicago*, published in 1893, during the World's Fair; in it he gave a vivid description of criminal and vicious tendencies in a great city.

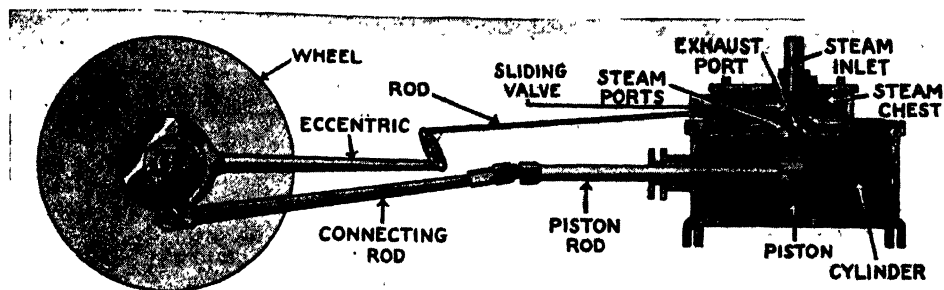
STEAM, *steem*. If you ask the average person whether he has ever seen steam, he will



From the painting by David Neal

Watt Discovering the Power of Steam. As a boy, James Watt lived in Greenock, a fishing town in Scotland, where his father was a merchant and shipyard-owner. The lad was not strong enough to attend school regularly, and he had ample leisure for using hand tools, in which he delighted, and for studying and investigation. There is a persistent story—the one depicted in the painting reproduced herewith—that Watt came to realize the power inherent in steam by watching the lid of his mother's teakettle as it bobbed up and down when the water was boiling. Like the story of Newton and the falling apple, this tradition cannot be verified, but it may very well have a basis of truth. The story has been made the theme of more than one painting. David Neal (1838-1915), who painted the picture shown above, was an American artist, born at Lowell, Mass. He studied abroad for several years after 1862, and his canvases represent the technique of the Munich (Germany) school, rather than American ideals. The Watt picture was exhibited at the Royal Academy in London, in 1874, but a more famous work is his *Oliver Cromwell and John Milton*, now a possession of the Cleveland (Ohio) Public Library. His *First Meeting of Mary Stuart and Rizzio* was awarded the Great Medal of the Royal Bavarian Academy. *Chapel of the Kings at Westminster* is in the F. Cutting collection, Boston.

In the Lowell (Mass.) Public Library is the canvas entitled *The Rialto, Venice*.



PRINCIPAL PARTS OF A STEAM ENGINE

answer "Yes." But he will be mistaken, for steam is colorless and invisible. Sometimes, in watching the cloud that comes from the spout of a teakettle of boiling water, you may notice that the vapor, which is mistakenly called steam, begins an inch or so from the spout. In the seemingly vacant space is the real steam, which is water transformed into gas; the visible cloud is water changed back into tiny particles of liquid by the cooler temperature of the air.

Steam may be caused by evaporation or by boiling, but hot steam almost always is meant when the word is used. When water is heated to the boiling point, 212°F. , bubbles of steam begin to rise through it. Until all the liquid has become gas, the temperature will remain at the boiling point. Meanwhile, five and one-third times as much heat will have been expended as was necessary to raise the temperature from the freezing to the boiling point. This heat is known as the *latent heat* of steam, because it will be given off again when the gas is condensed to water.

Steam occupies more space than the water from which it comes. Just at the moment when boiling ceases, the gas is 1,644 times as great in volume as the former liquid. At this stage, it is called *saturated steam*. If heated further, its temperature and volume continue to increase, and it is known as *superheated steam*. This tendency to expansion makes possible the steam engine. *Wet steam* supports particles of water still in liquid form; *dry steam* contains only gas.

A.L.F.

Related Subjects. Further information as to the nature of steam and its ability to do work may be found in the following articles in these volumes:

Boiling Point	Ship	Steam Hammer
Evaporation	Steam Engine	Steam Shovel

STEAM ENGINE. Nothing is more characteristic of modern civilization than the change from muscular to mechanical power for performing the work of the world. In this transformation, the steam engine has played a major part. It has revolutionized methods of transportation, commerce, manufacture,

and building construction. It has made possible most of the developments which constitute the progress of the modern age.

Yet the principle of the steam engine is simple. Energy is never lost; it may be changed from one kind of energy to another, or it may remain *latent*, or sleeping, for countless ages; but it is still capable of doing work. So man takes coal, in which energy has been stored by nature, burns it to bring out its energy in the form of heat, and places over the fire a boiler of water, to absorb the heat. When the water reaches the boiling point, its molecules begin to move apart, driven by the energy that was in the coal, but is now in a form in which, in its efforts to expand the steam, it will turn wheels for man.

A century before the Christian Era, there was in Alexandria a man named Hero, who experimented with steam and constructed a device which was like a Barker's mill, but which whirled by steam instead of water (see BARKER'S MILL). Nearly 2,000 years elapsed before the science of steam engineering advanced, and then, in the first year of the seventeenth century, an Italian named Della Porta wrote a book which told how to build a fountain whose waters would bubble up from the pressure of steam, and which stated that, when the steam cooled, it would condense and draw up more water from below. Upon this power of condensation inventors relied as much as upon expansion, until the nineteenth century. The first engine of actual service, patented in England in 1698, was a pump which was but an elaboration of Della Porta's fountain, and the Newcomen engine, the best-known when James Watt began his experiments in 1763, made no attempt at all to utilize the expansive power of steam.

Probably most people believe that James Watt (which see) was the inventor of the steam engine, and millions are familiar with the picture which shows him, an interested boy, watching the steam clouds from the kettle. But Watt was only the improver, not the inventor. What he accomplished for the world was to reduce the cost of operating a

condensing engine, and to make it practical for other things than pumping.

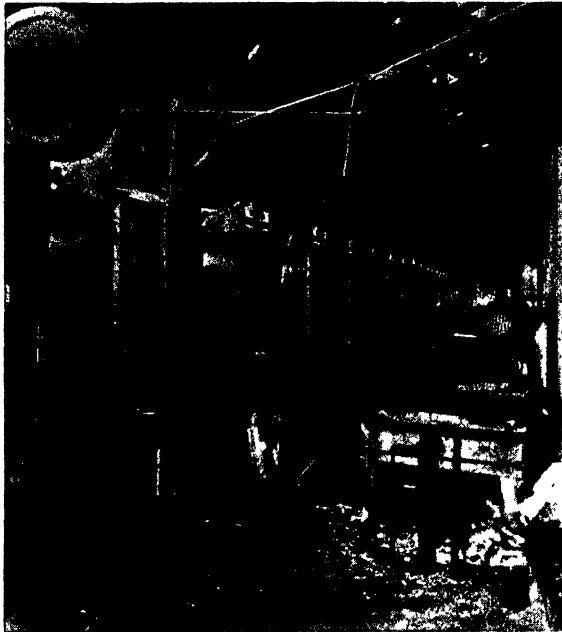
The Newcomen engine set Watt to thinking, because it consumed an enormous quantity of steam, hence large amounts of fuel. It had a cylinder and a piston (see the illustration for explanation of these terms). The piston rod hung from one end of a beam, and the weight to be lifted was suspended from the other end. The beam was pivoted at the center, so that, like a seesaw, one end went up when the other end went down. Steam was admitted below the piston, whereupon the counterweight pulled the piston up. Cold water was then injected into the cylinder, so that the steam condensed and made a partial vacuum beneath the piston. The top of the piston was open to the air, which, of course, exerted a pressure of nearly fifteen pounds to the square inch on it, and, when the vacuum was created beneath it, forced it down.

Watt saw that the alternate heating and cooling of the cylinder required large quantities of otherwise unnecessary heat. So he devised an engine in which the condenser and the cylinder were separate, and the latter always remained hot. As a result, three-fourths of the fuel cost for operating steam engines was eliminated.

Watt took out his first patent in 1769, and from that date we count the era of steam. He continued to make improvements on engines, perhaps the most important of which was the introduction of the principle of double action, in which steam is used first on one side of the piston, then on the other, as in the engine illustrated on page 6819. He also learned to shut off the steam when the cylinder was only partly filled, relying on expansion to complete the stroke. But he never experimented in the use of high-pressure steam; his own pressures were not much greater than the fifteen pounds per square inch of the air, while to-day, pressures of over 1,000 pounds are practical and are frequently employed.

The engine of Watt was of the reciprocating type—the cylinder and piston being employed for the utilization of the power. Since his day it has been vastly improved, not only by employing higher pressure, mentioned above, but by the development known as the compound engine, in which high-pressure steam does work in one cylinder, then passes to another, or even to a third and a fourth. A further improvement was accomplished through the principle of superheating, which consists in raising the steam to such a high temperature (about 700° F.) that the exchange of heat which occurs between the steam and the metal of the cylinder is greatly reduced.

Another radical improvement in steam engineering was the introduction of the turbine engine, in which the pressure, instead of being exerted on a piston, is employed to give momentum to blades mounted on a revolving shaft or drum. The turbine is especially effective in developing power on a large scale, or in cases where a high speed of rotation is desired. It is almost universally employed in power stations and for marine propulsion. See RAILROAD; SHIP; LOCOMOTIVE.



A BATTERY OF POWER HAMMERS

STEAM HAMMER. The steam hammer, invented by James Nasmyth in 1839, revolutionized all industries in which heavy forging was necessary. The Nasmyth hammer, as it was originally called, was raised by steam admitted into a cylinder beneath it. When the hammer was raised to the required height, the steam was allowed to escape and the hammerhead fell by force of gravity. The head might weigh 100 pounds, or as much as 100 tons. The first model was not a practical success, but subsequent improvements by one of Nasmyth's associates resulted in a device of great mechanical power. In the modern steam hammer, which is based on the first machines, steam is admitted alternately above and below the hammerhead, the pressure of the steam from above adding to the force of the downward stroke. So perfect is the control



ONE OF THE LARGEST SHOVELS EVER BUILT

It has a dipper of twelve cubic yards capacity; the boom is ninety feet long, and the dipper handle is sixty feet in length. As a matter of fact, it is not a steam shovel, for electricity has taken the place of steam in its operation. The scene above is in an Illinois bituminous coal mine.

of these mighty hammers that a blow with a force of hundreds of tons may be given, or one so gentle as to crack a nut without injuring the kernel. Electrically operated hammers are coming more and more into favor, and can be made as powerful as the largest steam hammers. See NASMYTH, JAMES.

STEAM HEAT. See HEATING AND VENTILATION (The Heating Problem).

STEAMSHIP. See SHIP.

STEAM SHOVEL, *shuv' 'l*, a large scoop operated by steam power. The scoop, or bucket, is attached to a beam which can be moved in any direction and raised and lowered at will, power being applied from a hoisting engine. The bucket is of iron or steel, with a capacity of one-half cubic yard to twelve cubic yards. It has teeth arranged along the front, so as to cut into earth or loose rock. The bottom is hung on a hinge, so that, when a catch is released, the load may be emptied instantly. The method of operation is quite simple. The dipper is lowered to the ground and driven forward and upward with a powerful sweep, gathering earth and rock as it goes. The beam is then swung into any desired position, and the

shovel emptied into cars or wagons, which remove the earth.

Commonly, all the parts of a steam shovel are mounted on a movable car. The great steam shovels with which the Panama Canal was excavated were capable of handling from four to five thousand cubic yards of rock or ore in a day. Steam shovels are extensively used in digging and loading ore in the iron mines of the Great Lakes region, and for all kinds of excavation work. Many of the larger shovels are operated by electricity.

STEAPSIN, *ste ap' sin*. See PANCREATIN.

STEARIC, *ste air' ik*, **ACID**, a solid, fatty acid which, when combined with glycerine, forms *stearin*, an important constituent of fats. See **STEARIN**.

T.B.J.

STEARIN, *ste' a rin*, a combination of stearic acid and glycerine, is the chief ingredient in mutton suet, beef tallow, and certain vegetable fats, such as palm oil. When crystallized, *stearin* forms pearly, waxlike scales, having neither taste nor odor, soft to the touch, and not greasy. It cannot be dissolved in water, but is soluble in ether and hot alcohol. When treated with superheated steam, it is resolved

into its component parts—glycerine and stearic acid. When stearin is boiled with alkali, the stearic acid combines with the alkali to form soap, and the glycerine is separated. Stearin is prepared for practical use from beef suet, cottonseed oil, and other fats. It yields an oil employed in the manufacture of butterine. Stearin is a complicated compound of carbon, hydrogen, and oxygen.

T.B.J.

STEATITE, *ste' a tite*, a soft rock, composed chiefly of talc. It has a soapy or greasy feel, and ranges in color from light gray to almost black. Steatite is easily sawed into slabs, and was formerly used in the manufacture of stoves in which wood was used for a fuel. The so-called *French chalk* is made of pulverized steatite. In localities having cold winters, small blocks of steatite are used for footstones, because they hold the heat for a long time. In New England, these stones are called *freestones*. Similar stones are used at the present time in fireless cookers. Steatite is also used as a filler in the manufacture of paper. Because of its peculiar oily feel, steatite is often called *soapstone*. Among the American Indians, soapstone was sometimes used for the mortars in which they ground their corn. Other uses for steatite are in the manufacture of "lava" tips for gas burners, for electrical insulation, as a filler for paint and rubber goods, as a lubricant, and as slabs for laundry tubs and sinks. See TALC.

A.J.

STEDMAN, EDMUND CLARENCE (1833-1908), an American poet and critic, born in Hartford, Conn. He studied at Yale, became editor of the *Norwich Tribune* in 1852, and later was connected with several other papers, serving on the *New York Tribune*, and as a war correspondent for the *New York World*, during the War of Secession. In 1869 he entered on a business career as a banker and broker, and retired from active life in 1900.



Photo: Brown Bros.

EDMUND CLARENCE STEDMAN

But his chief interest was always in literary work. *The Diamond Wedding*, a satire on society in verse, first attracted general attention to him. His *Alice of Monmouth* is the best narrative poem inspired by the War of Secession, but perhaps the best-known of his verses is *Pan in Wall Street*. For twenty years Stedman devoted himself to critical writing, but in his last years returned to poetry.

Other Works. *Victorian Poets and Poets of America*, his first critical works, he supplemented by *A*

Victorian Anthology and *An American Anthology*. He aided in the preparation of an eleven-volume *Library of American Literature*, and edited, with George E. Woodberry, *The Works of Edgar Allan Poe*.

STEEL. See IRON AND STEEL.

STEELE, SIR RICHARD (1672-1729), an important British writer of the early eighteenth century. To-day, he is remembered chiefly for his part in the development of the essay, though in his own day he was a successful playwright. Steele was born in Dublin, and educated at Charterhouse School and at Oxford. At Charterhouse he formed a friendship with Joseph Addison, afterward his associate in the periodicals for which the two are famous. Steele had a varied career. He served in the army, rising to the rank of captain, held various political offices, sat in Parliament, and found time to write witty plays, compose mediocre poetry, and establish periodicals and contribute to them. Though he earned comfortable sums of money, he was too impulsive, carefree, and generous to keep out of financial trouble, and spent his last years in retirement in Wales.



Photo: Brown Bros.

RICHARD STEELE

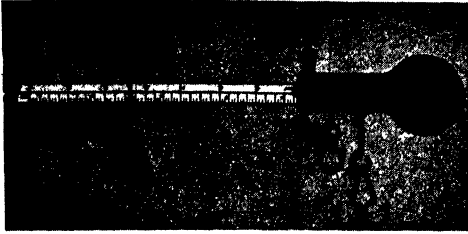
His Place in Literature. Steele has been called "the father of the English essay," but it is more correct to say that he took a form of literature already invented, and, with Addison, created a distinct type of essay, one that has endured. Steele founded the *Tatler* in 1709, and wrote most of the essays for it, though Addison contributed forty-two before the periodical ceased to exist, in 1711. Within two months, the friends had started the famous *Spectator*, which contains Addison's finest work. It was succeeded by the *Guardian*, and by several others, some of which Steele utilized for political arguing. It is generally agreed that Steele was inferior to Addison as a stylist, but he deserves enduring fame as the originator of the plan by which the essay became the mirror of contemporary manners. See ADDISON, JOSEPH.

STEELHEAD. See SALMON TROUT; TROUT.

STEELTON, PA. See PENNSYLVANIA (back of map).

STEELYARD, in mechanics, a device once in common use for weighing groceries and other commodities. It is of ancient origin, for it was employed by the Egyptians and Romans. It consists of an iron bar having one long arm and one short one, and is a lever of the first class (see LEVER). The article to be weighed is usually hung by a hook, or scale pan, from the end of the short arm; the counterpoise, whose weight is known, is hung on the long

arm, which is marked off into notches (see illustration). To obtain the weight of an article, the movable weight is shifted on the



THE COMMON STEELYARD

long arm until there is a balance, and the number at which the weight rests indicates the number of pounds or other units. The device is usually hung from a fixed support by a ring or hook. See **WEIGHING SCALE**.

STEEN, *steyn*, JAN (1626-1679), a foremost painter of Holland, ranking next to Rembrandt, among painters of the Dutch school, in range of subjects and ability to portray scenes of everyday life with dramatic effect. Like the English painter Hogarth, he could put a touch of satire into his work, but usually he painted with genial good humor. There was no phase of Dutch life that Steen did not depict; he represented with admirable insight the joys and the sorrows of people in all classes of society. His best canvases are distinguished for their clear coloring and excellence of composition. That he was an industrious worker is known from the large number of pictures he left—about a thousand, according to one authority. Aside from the facts that he was born in Leyden and studied in Utrecht and Haarlem, little that is authentic is known of his life.

Representative Paintings. Among Steen's notable works are *Eve of Saint Nicholas*, *The Rustic Wedding* (both at Amsterdam), *The Menagerie* (The Hague), and *The Music Master* (National Gallery, London). The Metropolitan Museum, New York, possesses three examples of his work.

STEENBOCK, HARRY. See **HUMAN GROWTH**, NEW KNOWLEDGE CONCERNING.

STEENBOK, *steen' bahk*, a variant of *steinbok* (which see).

STEEPLEBUSH. See **SPIRAEA**.

STEFÁNSSON, *sta' fahns sohn*, VILHJALMUR (1870-), discoverer of new land in the Arctic Ocean, was born in Manitoba of Icelandic parents, and educated in the United States. He made several trips to the far north before the Canadian government sent him to explore the northern shores of Canada and Alaska. About six months after sailing from Victoria, B. C., in June, 1913, the *Karluk*, largest of the three expedition boats, prepared for three years of scientific work, was caught in the ice and sank, with a loss of eleven lives.

Stefánsson, with several companions, happened to be ashore hunting caribou, and, undismayed, resumed the journey by sledge. With two men and six dogs, the explorer crossed Beaufort Sea on moving ice, surveying large areas from Martin Point to Banks Land. Next he started north from Cape Kellett, Banks Land, discovering in June, 1915, a mountainous region to the north and west of Prince Patrick Island. During the next two years, he pushed farther north, reached unknown land west of Axel Heiberg Island, and found that the ocean is shallow northwest of Cape Isachsen. The expedition returned to Canada in 1918.



STEFÁNSSON

Writings. Stefánsson's written works include *The Friendly Arctic*; *Go North, Young Man*; *Hunters of the Great North*; *The Adventure of Wrangel Island*; *The Standardization of Error*; and various anthropological reports.

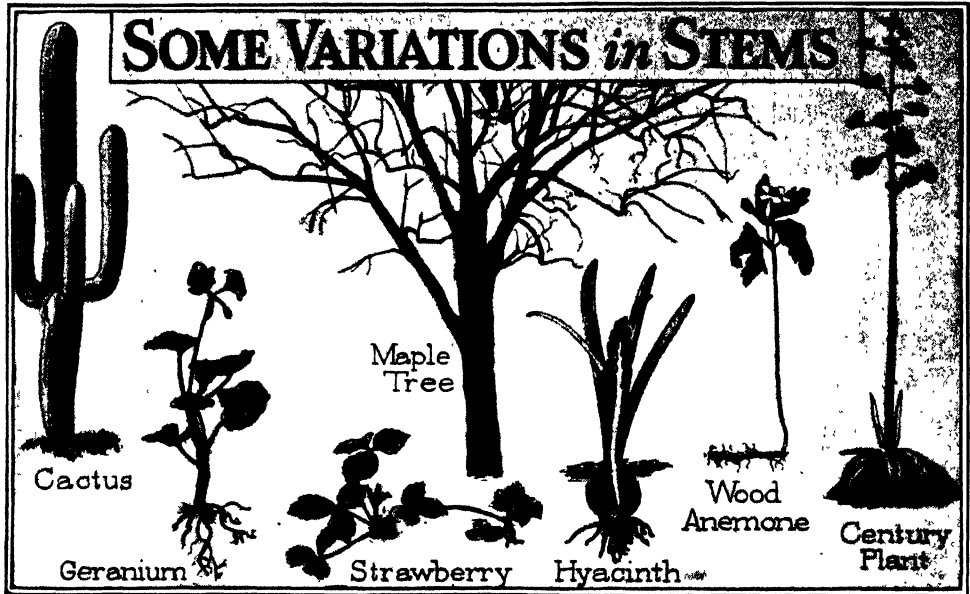
STEGOSAURUS, *steg o saw' rus*. See illustration in the article **DINOSAURIA**.

STEINACH, *shline' ahk*, DR. EUGEN. See **GLANDS** (Gland Transplantation).

STEINBOK, *stine' bahk*, OR **STEENBOK**, a very small antelope found in the southern part of Africa. Its Dutch name, which means *stone-buck*, was given because it is usually found in rocky places. The steinbok is about twenty-four inches tall, and has a reddish-brown coat that is white underneath. The male has two forward-curving ringed horns, about four inches long. The European ibex is also called a steinbok. See **ANTELOPE**; **IBEX**. W.N.H.

Scientific Name. The steinbok belongs to the family *Bovidae*. Its scientific name is *Nanotragus campestris*.

STEINMETZ, CHARLES PROTEUS (1865-1923), "the little cripple with a giant mind," was accounted the greatest electrical genius of his day, with the exception of Thomas A. Edison. He was born in Breslau, Germany, and educated in Breslau, Berlin, and Zurich, Switzerland. He received his middle name, Proteus, from his fellow students in Breslau University, as a tribute to his versatility. The devotion of an American student in Zurich brought him to the United States. When the young man had to return home, he offered to divide his money with Steinmetz if the latter would come with him. As Steinmetz was exiled from Germany because of his socialist activities, he readily agreed.



In 1893 he joined the engineering force of the General Electric Company in Schenectady, N. Y. True to his socialistic views, he refused to accept any salary other than living expenses. He was at the head of a magnificently equipped laboratory, where he carried on his amazing electrical experiments. He invented the induction regulator, the metallic-electrode arc lamp, and an electric automobile, and did much to further the progress of applied industrial chemistry. A remarkable ability to explain in simple language the most abstruse problems makes his many technical books of interest even to a layman.



Photo: U & U

CHARLES P. STEINMETZ

Steinmetz was professor of electrophysics in Union University from 1902 until his death, president of the city council of Schenectady, and president of the board of education. He was a hunchback.

STELLA. See SWIFT, JONATHAN (His Literary Career).

STELLER SEA LION. See SEAL (Other Seals).

STELLITE, *stel' ite.* See ALLOY.

STEM, the stalk of a plant, shrub, or tree, which supports the leaves in the most advantageous position to receive light and air. It is a coworker with the leaves in changing into

plant food the raw materials obtained from the soil. The water and dissolved salts taken in by the roots are carried to the leaves by the stem. There, primarily, they are converted into plant food, for it is in the leaves that the inorganic substances, water and carbon dioxide, are used as building materials for sugar—presumably, the first organic product to be manufactured in the unceasing mills of vegetation and crops. The energy for this process is furnished by sunlight. As indicated elsewhere, the chief channels of conduction of all the successive organic products formed in green tissues—and used throughout leaf, stem, and root as nourishment—are certain portions of the vascular bundles, termed the *sieve tubes*, or *sieve-tube system*. In one large class of plants (dicotyledons), this system is normally located in the inner bark.

In green-stemmed plants, the stem, of course, shares the work of food manufacture, but green tissue in the stem disappears when the light is excluded, by the development of a thick, corky bark. In any case, the stem contributes, each season, a full share of new growth—of the permanent new growth—while it serves also as a distributing channel and as support. In leafless plants like the cactus, the thick, green stems, which are usually broad and flattened, exposing a large surface to the light and air, perform the functions of the leaves. The fleshy stalk also holds water, supplying the plant in times of drought. This reserve water has allayed the thirst of many a traveler in the arid plains of Southwestern United States. Some desert plants are able to withstand drought for ten years or more.

The stems of marsh and water plants contain passages and cavities filled with air, supplying the plant when it is submerged, and buoying up the leaves (see AIR SPACES).

Structure and Growth. If a leafstalk of celery is allowed to stand in an aniline dye and then removed and examined, it will be seen that there are definitely stained regions, showing that the liquid passed upward into the leaf by certain tissues, or bundles of long, narrow, tubular cells. The actual path is through the xylem, or woody part of the *fibrovascular bundles*, whose name means *collections of threadlike, woody tubes*. Those plants in which the bundles of cells are distributed irregularly throughout the stem, as in the cornstalk, are the *monocotyledons*. The group in which the bundles are arranged radially around the pith, as in our common trees, are in general the *dicotyledons*.

The stems of the latter plants consist of an outer protective covering of bark and woody layers extending to the pith. The cells are of several kinds. In the bark there may be cork layers, preventing loss of water; flexible, tough, fibrous cells giving strength to the stem; sieve tubes carrying the plant food from the leaves; and woody cells forming the channel through which the water passes to the leaves from the root. Between bark and wood is a layer of growing tissue, the *cambium*, whose function it is to form new bark on the outer side, and new wood on the inner side. The lifetime of a tree is reckoned from the number of rings or layers of new wood formed by these growing cells.

In some plants, the stems live but a year, in others two years, and in still others, indefinitely. The death of certain annual plants is not due to the arrival of cold weather, as is often supposed, but to the fact that, after fruiting, growth stops and the plants die. Thus the life of the plant may be limited to a certain period, even in regions where there is no cold winter and not even a single frost.

Stems vary greatly in thickness, ranging in width from the immense trunks of the big trees of California to the slender aspen stem which is so delicate that the leaves constantly quiver and softly rustle, giving the tree the name "trembling-leaved poplar." The rate of growth also varies in different plants. The sunflower and giant ragweed stalks grow ten or twelve feet in a season, and slender, climbing stems often grow forty feet in a single summer, while many trees increase in height but one to three inches a year. In the competition to secure light and air, trees in dense forests and plants in thick clumps grow tall and branchless for a great height, but when growing alone, they are low and broad-topped.

Underground Stems. The long, slender rootstocks of the May apple, Solomon's seal, mints,

and several other plants, the short, thick bulbs of the hyacinth and lily, and the familiar tuber of the potato are underground stems. They contain large quantities of reserve food, and supply the plant when new food cannot be made. Some produce aerial stems; others send up leaves and have no stem above the ground.

Reproduction by Stems. Many plants are reproduced by portions of the stem. Our most obnoxious weeds are those which have underground stems, or rootstocks, which, though cut by the hoe, produce a new plant at every node.



Photo: Visual Education Service

UNDERGROUND STEM OF SOLOMON'S SEAL

The slender runners of the strawberry, the bulbs of the lily, and tubers of the potato also produce new plants. The black raspberry forms a new bush by the rooting of an ordinary branch, and many plants, such as the snap willow, geranium, grapevine, and currant bush, are reproduced from cuttings, or broken-off stems, which take root when planted. The propagation of orchard trees by budding and grafting is a very important practice.

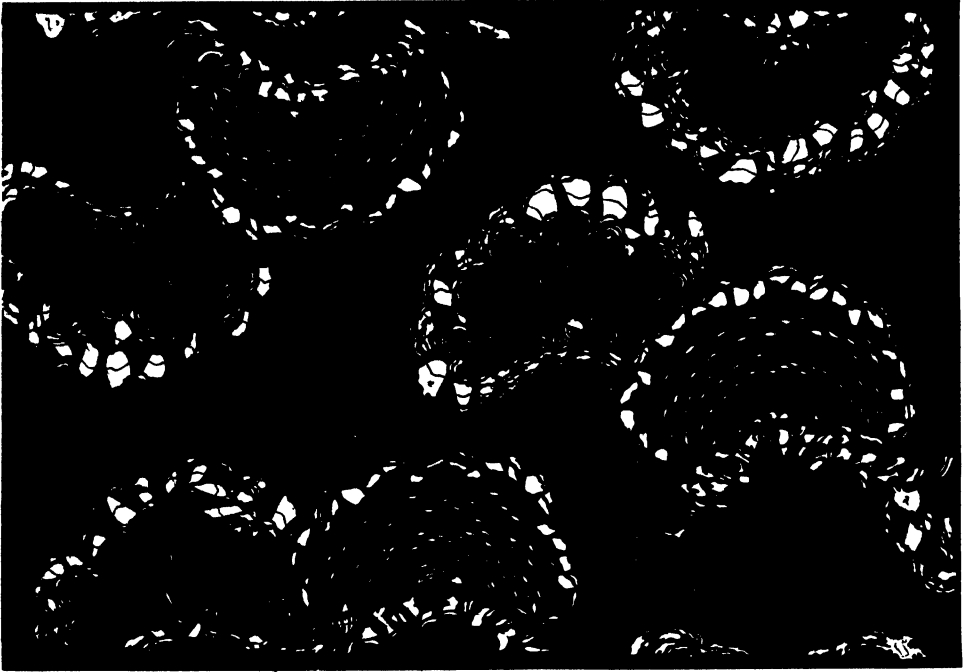
Economic Uses of Stems. The food obtained from the stems of plants is of great importance to man and animal. Cane sugar and molasses and maple sugar and syrup are produced by the stems of the sugar cane and maple tree; the edible parts of potatoes and onions are underground stems; asparagus, celery, and other vegetables are aerial shoots; syrup is derived from cornstalks, which also are an important food of horses and cattle. The fleshy stems of the prickly-pear cactus of the thornless variety are another valuable cattle food, and many wild animals, such as the deer, moose, and rabbit, browse on the twigs and stems of numerous plants. Common starch is derived from the potato, and sago is made from the starchy pith of the trunk of the palm tree. Perhaps most important of all has been the employment of the wood of trees for building purposes.

B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles:

Annuals
Biennials
Botany
Bulb
Cotyledon

Grafting
Leaves
Perennials
Sap
Tree



A JAPANESE STENCIL OF REMARKABLE BEAUTY

STENCIL, *sten' sil*, a thin sheet of metal or other material with a pattern cut out by means of interrupted lines or dots. It is used in reproducing letters and designs. The stencil is placed on the surface or material to be ornamented, and a brush or sponge wet with ink or paint is passed over it. Packing boxes are often marked with stencils, and the process is employed extensively in embellishing curtains, bed covers, garments, and other household articles. Furniture also lends itself to stenciling. Churches and other public buildings are often decorated on the interior with stencil designs. Because of its practical value, the process is taught in grade schools and applied-art classes. See, also, MIMEOGRAPH.

STENOGRAPHY.
See SHORTHAND WRITING.

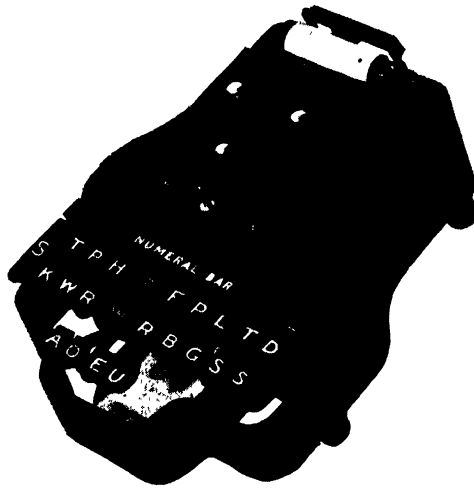
STENOTYPE, a machine used to record dictation or speech rapidly and accurately; in other words, a shorthand machine. The

stenotype has a keyboard of twenty-three keys, so spaced that two may be struck with one finger, with an ease and silence of operation that cause a minimum strain on the nerves. The characters are the English alphabet, arranged so that the fingers of the left hand

print the beginning consonants of a word, the right hand the concluding consonants, and the thumbs the vowels. Several letters of the alphabet have been omitted, to simplify operation, and they are supplied by combinations which may be printed by a single stroke; thus, a beginning consonant "B" is represented by striking simultaneously the two letters "PW."

A system of simplified spelling is employed. All silent letters are dropped, and words most frequently used are written with a single

letter. The notes are printed on a narrow tape of paper which progresses automatically, a line with each stroke, and each symbol



THE STENOTYPE

always occupies the same position in the line. The notes have the advantage of being easily transcribed by anyone familiar with stenotypy. The simple sentence "He was at our house" would appear:

H E
W A S
A T
O U R
H O U S

Most words may be written with a single stroke, and many phrases are so symbolized as to require only one stroke. A stenographer, W. S. Ireland, invented the machine.

STEPHEN, *ste' ven* (about 1097-1154), a king of England, whose reign, lasting from 1135 to 1154, was one of the darkest in English history. He was the third son of Stephen, Count of Blois, and Adela, daughter of William the Conqueror, and was a nephew of Henry I of England. In return for taking an oath to secure the succession of Matilda, the king's daughter, he was given large estates in Normandy, as Prince William, the rightful heir, was drowned. On the death of King Henry, in 1135, Stephen hastened from Normandy to England, laid claim to the throne on the ground that his early vows were made under compulsion, and was crowned king in Westminster Abbey. After Matilda, with her half brother, the Earl of Gloucester, landed in England, revolts broke out, Stephen was imprisoned, and Matilda acknowledged queen. The war was renewed and lasted for nearly seventeen years, plunging England into misery. According to the peace treaty, made in 1153, Stephen was to retain the kingdom until his death, but was to be succeeded by Matilda's son, Henry of Anjou, first of the Plantagenet line. See **HENRY** (England); **PLANTAGENET**.

STEPHEN, the first Christian martyr. He was stoned to death on the streets of Jerusalem, after the Ascension of Christ. Although only one of the seven deacons appointed by the Apostles to minister to the poor, Stephen was a man of great piety and performed miracles. He preached eloquently of salvation through belief in Christ, but, by minimizing the importance of Mosaic customs and institutions, especially those pertaining to the Temple, he antagonized the Jews. Accused of blasphemy and brought to trial before the Sanhedrin, Stephen defended himself with a masterly speech (*Acts vii*). He proved that he was not speaking against the "Temple and the Law," but that, by persecuting him, his accusers were disobeying the Law. Infuriated, the mob attacked and killed him. Saul, who had not yet been converted, witnessed the tragedy, and "was consenting unto his death."

December 26 is celebrated in the Roman Catholic Church and the Church of England as Saint Stephen's Day. A minor celebration

is held on August 3, the date on which his relics are supposed to have been discovered, in 415.

STEPHENS, **ALEXANDER HAMILTON** (1812-1883), an American lawyer and statesman and Vice-President of the Confederate States of America, born near Crawfordsville, Ga. He entered Franklin College, now the University of Georgia, with the view of becoming a minister, an educational society defraying his expenses. In 1834 he passed a law examination, was admitted to the bar, and also taught school to repay those who had helped him. From 1836 to 1842, he was a member of the state legislature, and from 1843 to 1859, he was a Representative from Georgia in Congress. He was strongly opposed to secession in 1861, but remained loyal to his state when Georgia seceded. Stephens was elected to the Confederate Provisional Congress, and was later chosen Vice-President of the new government, but was often at variance with President Davis, on questions of states' rights.

In February, 1865, he headed the unsuccessful peace commission which conferred with President Lincoln at Hampton Roads (see **HAMPTON ROADS CONFERENCE**). He left Richmond before the war ended, and after the downfall of the Confederacy, was arrested and imprisoned for six months at Fort Warren, in Boston Harbor. In 1866 he was elected to the United States Senate, but was not permitted to take his seat; so he turned his attention to writing the first volume of *The War Between the States*. Being in reduced circumstances, he taught law classes in 1871, and also served as editor of the *Atlanta Sun*, which was published to defeat Horace Greeley for the Presidency. He was elected governor of Georgia in 1882 by 60,000 majority, and died in office. His statue is in Statuary Hall (which see).

His Writings. In addition to the above-mentioned book, which presents the Southern viewpoint on state sovereignty and secession, Stephens also wrote an answer to his critics, *The Reviewers Reviewed*, and *A School History of the United States*.

STEPHENSON, the family name of two British engineers, father and son, both of whom made valuable contributions to the development of England's railway system.



Photo: Brown Bros

ALEXANDER H. STEPHENS
One of the great leaders of the Confederate States of America from 1860 to the end of the War of Secession.

George Stephenson (1781-1848), the elder Stephenson, won the name of "founder of railways." He was born at Wylam, near Newcastle. After working on a farm, he assisted his father as fireman in a colliery. His first invention was a miner's safety lamp; next he worked out the idea of applying steam power to locomotive engines, and set one to work in 1814 to operate on a colliery tramway. An improved engine, completed the following year, continues, with Watt's steam engine, to serve as the model in locomotive construction.

Stephenson was appointed chief engineer of the Stockton & Darlington Railway in 1821. Three years later, he became engineer of the Liverpool & Manchester Railway, whose formal opening, in 1830 (see RAILROAD), marked the real beginning of the British railway system. This railroad purchased his famous yet crude locomotive, the "Rocket," which attained the then amazing speed of nearly thirty miles per hour. Before long, Stephenson's reputation was so great that he was consulted on every large engineering project of his time. See LOCOMOTIVE.



Photo: Brown Bros.

GEORGE STEPHENSON
The first "railroad man."

Robert Stephenson (1803-1859), the son of George Stephenson, was born at Willington Quay. He supplemented a good general education with science courses at the University of Edinburgh. After assisting his father in railway surveying, in 1824 he went to South America to take charge of mining operations, and on his return to England helped in the building of the locomotive known as the "Rocket," which won a prize of £500 (\$2,500). He afterward became chief engineer on the construction of the first railway to enter London, known then as the London & Birmingham Railway.

Robert Stephenson was, however, chiefly noted for the engineering genius shown in the great bridges and viaducts constructed by him. He invented the tubular bridge, and also introduced the use of tubular girders in the construction of iron bridges. Especially notable achievements are the high-level bridge at Newcastle, the famous Britannia tubular bridge over Menai Strait, and the Victoria Bridge across the Saint Lawrence River, at Montreal. Stephenson visited Germany, Switzerland, and many other parts of Europe, and Canada, Egypt, and India, for the purpose of building railways in those countries. Taking considerable interest in the political affairs of his country, he was elected a member of Parliament for Whitby, Yorkshire.

B.M.W.

STEPPE, *steps*, the Russian name for the extensive, treeless lands extending from South-eastern Europe along the borders of the Caspian Sea to the Altai Mountains in Central Asia. As there is little moisture, farming without irrigation is impossible, although, just northwest of this region, lies the vast "black-earth" plain, the best agricultural section of the Soviet republic, where enormous quantities

of grain are raised. During the spring, when the rains start the grass growing, great herds of cattle, sheep, and horses may be seen grazing, but they are soon led to better pasturage by the wandering tribes of Tartars, for the summer droughts dry up the lands. The great plains of Western North America and the semi-arid parts of the treeless plains, or *pampas*, of Argentina are also steppes.

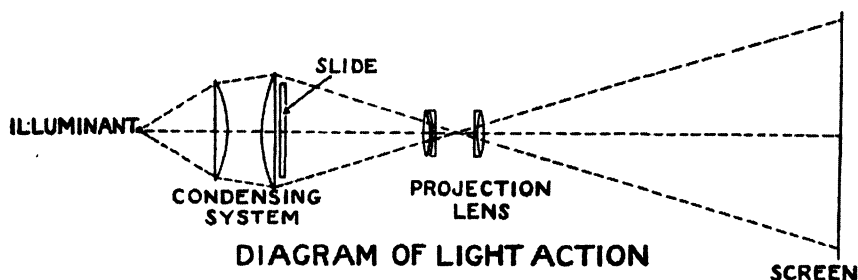
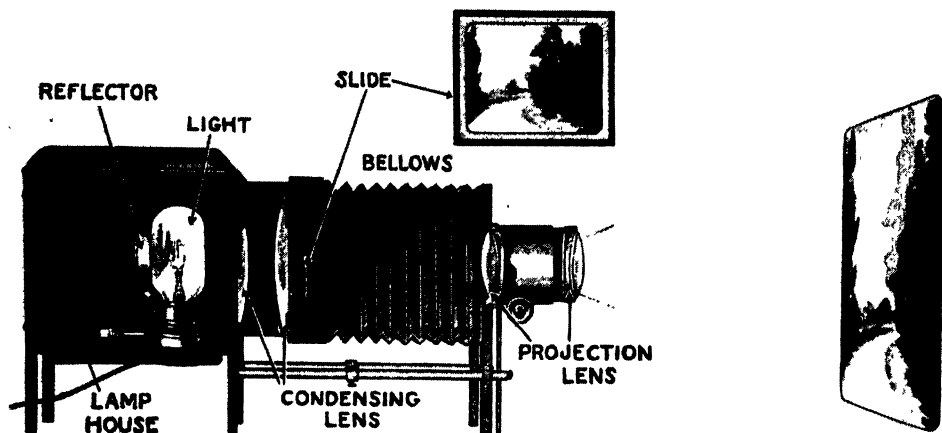
R.H.W.

STEREOPTICON, *stehr e op' tih kon*, an apparatus for projecting on a white surface a magnified image of a picture. The principal parts of the apparatus are the lantern, or box for enclosing the light, the condenser, the objective, and the light. The lantern box, which is usually made of sheet iron of the best quality, has openings at the top and bottom to provide thorough ventilation. A door on the side next to the operator gives ready access to the light. The condenser consists of a large, double-convex lens (see LENS), or, more frequently, of two plano-convex lenses with their curved surfaces facing each other. The purpose of the condenser is to gather the rays of light and throw them upon the picture to be projected. The objective consists of two double-convex lenses, mounted in a tube of the right length to enable each lens to aid in magnifying the picture. This tube is mounted in a frame with a rack and pinion, enabling the operator so to adjust the focus of the objective to the condenser as to get a sharp definition of the picture on the screen.

The Light. Various devices are used for illuminating stereopticon pictures. That in most general use, and the most satisfactory where large pictures are required, is the electric arc light in which the carbons are arranged at right angles. This gives a strong, even white light, but its manipulation requires some skill. Single lanterns are on the market which use an incandescent light that can be operated by connecting it with an ordinary electric-light attachment. For use in small rooms requiring a picture of medium size, these lanterns are very satisfactory. They can also be used with a battery of dry cells, and are well adapted to schools and halls in rural communities. Acetylene gas and the oxyhydrogen limelight are also in use, but they have virtually been replaced by the electric light, because of its greater convenience and reliability.

The Screen. The screen should have a plain, white surface, perfectly flat and free from wrinkles. Lecture rooms are usually fitted with a white wall for a screen. Heavy muslin, hemmed and bound with cord, so that it can be tightly stretched, makes a very satisfactory screen, and screens of this sort are in general use.

The Slides. The pictures generally used in stereopticons are photographs on glass, and are known as slides. The American slide is 4x3¼



MECHANISM OF THE STEREOPTICON

inches, the English slide $3\frac{1}{4}$ inches square. They may or may not be colored by hand. Since the perfection of colored photography, beautiful slides are made by that process [see PHOTOGRAPHY (Color Photography)]. Because the lens inverts the picture, the slide must be inverted in the lantern, to have the picture appear correctly upon the screen.

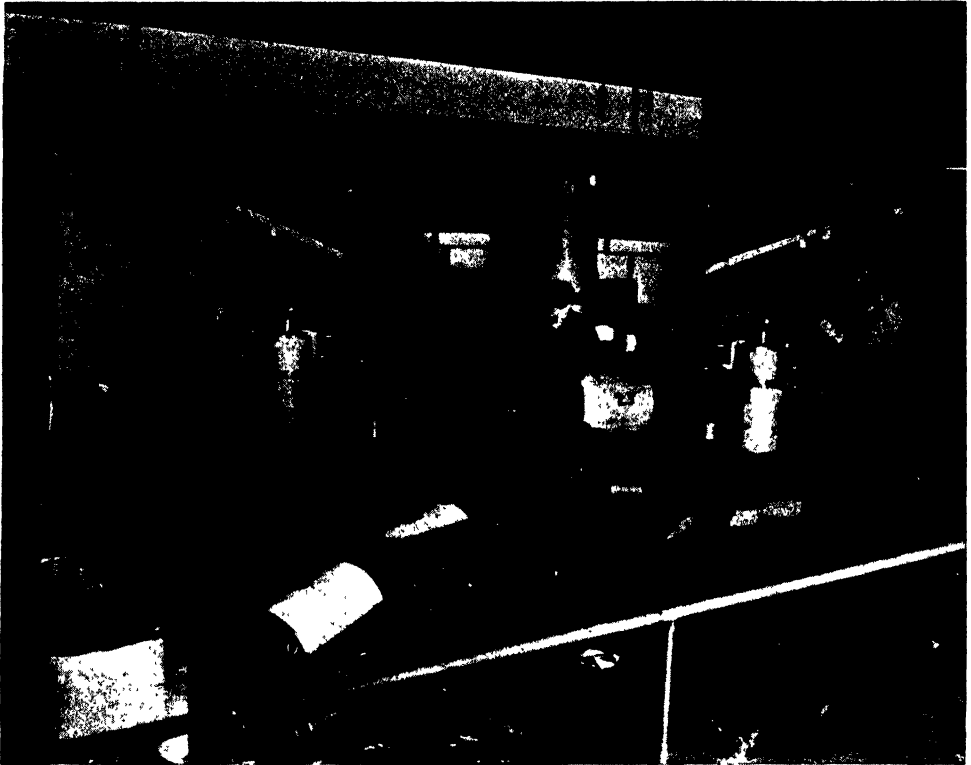
Dissolving Views. The dissolving-view effect is produced by a double lantern with the objectives so adjusted that each covers the same field on the screen, and by an attachment which gradually shuts off the light from one picture as it is turned on the other. In the hands of a skilful operator, very pleasing effects are produced.

STEREOSCOPE, an instrument through whose lenses photographs are transformed into pictures that are quite lifelike, with an effect of depth, distance, and solidity ordinarily possessed only by actual scenes and objects. The first stereoscope was invented in 1838 by Sir Charles Wheatstone in England, but the instrument which came into common use was an improved and simplified model which was developed by Sir David Brewster. Oliver Wendell Holmes, in the United

States, brought out still another model, based on the same principle as Brewster's machine, but much changed in appearance.

The principle of the stereoscope is comparatively simple. It must be remembered that the eyes of a human being may be compared to cameras; each eye reproduces a separate picture, and the brain combines them into one. Because the eyes are some distance apart, the pictures reproduced are not exactly alike. Each eye sees more of one side of a given object than does the other; together, the two eyes see farther around the sides of an object than can one eye alone. This is what gives objects the effect of standing out from their backgrounds. In the stereoscope, the eyes see, through lenses, two separate photographs, exactly alike, but differing to just the degree that the actual scenes would have differed when seen by the eye. These two photographs, which are placed in a rack and arranged so that each eye sees only one, are combined by the brain into one picture, which gives the lifelike effect.

In taking stereoscopic pictures, one camera with two lenses is commonly used, although two separate cameras would, of course, serve the same purpose. Theoretically, the lenses



A STEREOTYPING OUTFIT

The plates are made inside the round structure in the center. One pull of the lever completes the cast. The curved plates are then inspected, and later arrive at the stack shown in the left foreground, ready to be conveyed to the pressroom.

should be placed exactly as far apart as are the human eyes, but in practice it is found more satisfactory to increase the distance, thereby securing an effect of greater depth and distance.

Not many years ago, nearly every family possessed a stereoscope, and it occupied with its pictures a prominent place on the parlor table. The popularity of the device has decreased with the advent of moving pictures and of books with halftone illustrations. A stereoscopic camera used in taking moving pictures has been perfected (see MOVING PICTURES).

STEREOTYPING. A stereotype is a plate made from type metal and used in printing. The process of making such a plate is known as *stereotyping*. The type is set and locked into forms. The face of the type is then brushed over with a brush containing a small quantity of oil. A pulp consisting of a mixture of clay and papier-mâché is then pressed down on the forms, so that a perfect impression of the face of each piece of type is made in the pulp. Next, the form is placed in a chamber and baked until the pulp is dry and hard, when it is lifted from the type. This mold, or *matrix*,

as it is called, is then ready for the stereotype plate, which is made by placing the matrix in a box face up, and pouring melted type metal over it. This hardens at once, forming a solid plate of type metal, and from this the page is printed. Plaster of Paris or clay may be used for the matrix, but papier-mâché is in general use.

Plates for use on small presses are flat, but those used on the rotary presses on which daily papers are printed are in the form of a half cylinder (see PRINTING PRESS). Stereotype plates are inexpensive and can be quickly made, the time required being about fifteen minutes. They are specially adapted to newspaper work. A number of plates can be made from the same matrix, and in all large cities there are firms that make a specialty of supplying country newspapers with a part of their subject matter in this way (see NEWSPAPER). The use of the stereotype is now limited to printing newspapers and the cheapest editions of books. For work of a higher grade, the stereotype has been replaced by the electotype. See ELECTROTYPING.

STERLET, *stur' let*. See STURGEON.

STERNE, *sturn*, LAURENCE (1713-1768), an English author who had a distinct part in the development of the novel as a form of literature. He was born at Clonmel, Ireland, and as his father was an officer in the army, the boy's early years were spent in traveling from place to place with the regiment. In 1736 he was graduated from Cambridge, and two years later was ordained and given a living in Yorkshire. There he lived for twenty years, performing the duties of a country clergyman and delighting in the works of the old humorists and romancers. With the publication of the first two volumes of *Tristram Shandy*, in 1759, his seclusion ended, for at once the book became very popular, and the author was much in demand in London society. Seven other volumes of the work appeared within the next eight years, and Sterne's popularity increased. A journey on the Continent in 1765 resulted in *A Sentimental Journey through France and Italy*, which became the book of the moment in England, France, and Germany. Sterne lived but a month after the publication, in 1768, of what were to have been only the first two volumes.

Estimate of His Work. These two works, the author's only ones except volumes of sermons and some letters, have the fault of the time in which they were written, which did not demand delicacy in its writers. The sentimentality, too, seems obvious and overdone to a present-day reader; but the merits of the books are no less positive than their faults. Humor pervades the pages, and the easy, rambling style fits excellently the content. More important than all else, Sterne was a real creator of character, and some of the figures from his writings, notably Uncle Toby, from *Tristram Shandy*, will live as long as English is read.

STETHOSCOPE, *steth' o skohp*, a device used by physicians in examining the heart and lungs. Tests are made by listening to the sounds of these organs, as irregularities indicate certain diseases [see **HEART** (Sounds of the Heart)]. The simplest type of this instrument is a wooden tube about a foot long, hollow through the center and widening out at one end into a bell-shaped flange, which is placed against the chest. The other end is provided with an **earpiece**. A later device is equipped with **two earpieces**, joined to the chestpiece by rubber tubes. An instrument on the same order, but much more delicate, is known as a *phonendoscope*. It is a shallow, metal cup having attached to it two rubber ear tubes and a small rod ending in a button, the latter being placed against the chest. When the sounds must be determined with great exactness, this instrument is considered preferable to the stethoscope, as it magnifies the sounds.

STETTIN, *shlet een'*. See **GERMANY** (Principal Cities).

STEBEN, *stu' ben* (in German, *shtoi'-ben*), **FREDERICK WILLIAM AUGUSTUS**, Baron von (1730-1794), a brave German soldier who sailed to America, during the Revolutionary War, to aid the colonies. He was a veteran of two European wars, with a thorough knowledge of military tactics, and Washington made good use of him, sending him to Valley Forge immediately to drill the raw colonial troops and establish an efficient military régime. As soon as he had the troops in one section trained, he was transferred elsewhere to "collect, organize, and discipline" more recruits. After the war, he spent the rest of his life in the United States. New York, Virginia, Pennsylvania, and New Jersey gave him grants of land for his services, and Congress voted him a gold-hilted sword and a pension of \$2,400.



Photo Brown Bros.

BARON STEUBEN

Von Steuben spent the last years of his life in a log cabin near Utica, N. Y., and in 1914 a monument erected to his memory was unveiled at Utica.

STEBENVILLE, OHIO. See **OHIO** (back of map).

STEVENS, ALFRED. See **SCULPTURE** (England).

STEVENS, THADDEUS (1792-1868), an eloquent leader in the American Congress in the period of slavery agitation, one of the most aggressive of the anti-slavery group. He was born at Danville, Vt., was graduated at Dartmouth College in 1814, and for a time taught school at York, Pa. Later, he studied law and began practice in Gettysburg. He served in the state legislature, and in 1848 and again in 1850 was elected to Congress, where he was a strong opponent of the fugitive slave laws, the Kansas-Nebraska Bill, and all other measures favorable to Southern interests. In 1858 he was again elected to Congress, becoming the



Photo: Brown Bros.

THADDEUS STEVENS

acknowledged leader of the House and chairman of the Ways and Means Committee. He was bitterly hostile to the seceding states, and was a pronounced advocate of emancipation and the enfranchisement of the negro. In 1868, in a speech in Congress, he proposed the impeachment of President Johnson, and was one of the committee named to prepare the articles of impeachment.

Related Subjects. The reader is referred in these volumes to the following articles:

Emancipation Proclamation	Impeachment
Fugitive Slave Laws	Kansas-Nebraska Bill

STEVENS INSTITUTE OF TECHNOLOGY. See NEW JERSEY (Education).

STEVENSON, ADLAI EWING (1835-1914), an American statesman, Vice-President of the United States during Cleveland's second administration. He was born in Christian County, Ky., and was educated at Centre College, in the same state. He was admitted to the bar in 1857, and began practice in Illinois. Having become active in the state Democratic party, he was elected to Congress in 1874. After the first election of Cleveland (1884), Stevenson was appointed First Assistant Postmaster-General, and in 1892 was elected Vice-President of the United States on the ticket with Cleveland. On the expiration of his term, Stevenson was appointed a member of the American commission on the adoption of international bimetalism. He was again a nominee for the Vice-Presidency in 1900, on the ticket with William J. Bryan, but failed of election. In 1908 he was the Democratic nominee for governor of Illinois, but was defeated by Deneen. His chief published work was a book of political reminiscences.

STEVENSON, ROBERT (1772-1850), a Scottish engineer who built the Bell Rock lighthouse, overcoming what would almost appear insurmountable difficulties. He was born at Glasgow. As engineer and superintendent of Scottish lighthouses, he earnestly devoted himself to the task of rendering navigation more safe. He erected twenty-three lighthouses on the coasts of Great Britain, and was the inventor of the flash, or intermittent, light now universally adopted. On one of his tours of inspection as chief engineer, Stevenson was accompanied by Sir Walter Scott, who described the famous Bell Rock lighthouse in

his diary. In addition to his great work in behalf of safe navigation, Stevenson was widely consulted on the construction of roads, bridges, harbors, canals, and railways. He died in Edinburgh. His son Thomas was the father of Robert Louis Stevenson, poet and novelist.

STEVENSON, ROBERT LOUIS [properly, ROBERT LEWIS BALFOUR] (1850-1894), a Scottish essayist, poet, and writer of fiction, born in Edinburgh, November 13, 1850, of a well-to-do family. His father was a civil engineer, and the son showed much interest in that profession, which he was not robust enough to adopt. He studied at the University of Edinburgh, though his work was constantly interrupted by ill health, received a training in law, and was called to the bar at Edinburgh, in 1875. However, he turned from law to literature, and in 1878 published *An Inland Voyage*, in which is described a canoeing journey in France and Belgium. Critics recognized at once the charm of the young writer's style, but the public gave the graceful sketch little attention. In the following year, he published *Travels with a Donkey*, the material for which had been furnished by a trip through Southern France.

His Marriage. In 1876 Stevenson had met Mrs. Osbourne, the lady who afterward became his wife, and in 1879 he learned that she was ill in California. Deeply alarmed, he set out at once on the trip across the Atlantic. As travel was expensive and his means were small, he went as a steerage passenger, and crossed the Continent on an immigrant train; and of these experiences, he made use in *The Amateur Emigrant* and *Across the Plains*. Arrived in San Francisco, he married Mrs. Osbourne, and, after some months spent in a desolate mining camp, returned with her and her son Lloyd to Scotland. His health was always far from robust, had suffered severely from the strain of his journey and his anxiety, and the years following his marriage were wandering ones, spent in search of strength.

Sought Far for Health. In 1888, still in search of health, Stevenson went with his family to Samoa, in the South Seas, where he remained until his death. His home, at the foot of Mount Vaea, he christened Vailima, and his work in superintending the building and the improvement of it was a delight to him.



Photo: Brown Bros.

ADLAI E. STEVENSON



Photo: U & U

ROBERT LOUIS STEVENSON



Photo: U & U

THE SAMOAN HOME OF STEVENSON

The building is on the island of Upolu, about two miles from the sea. It is now occupied by the governor of the Fiji Islands.

He acquired great influence with the natives, and took an active interest in their politics, attending councils, where he sat in state. He died December 3, 1894, of apoplexy, and the next day sixty natives carried his body to the summit of Mount Vaea, where he was buried.

His Great Work. In spite of the ill health that would have daunted a less courageous man, and the unfavorable conditions made unavoidable by his constant traveling, Stevenson produced between 1880 and 1888 two collections of delightful essays, *Virginibus Puerisque* and *Familiar Studies of Men and Books*; a volume of fanciful and entertaining stories, the *New Arabian Nights*; the very popular *Treasure Island*; *Prince Otto*, a pleasing romance; *Dr. Jekyll and Mr. Hyde*; *Kidnapped*, an excellent and widely read story of Scottish life; and two collections of poems, *Underwoods* and *A Child's Garden of Verses*, the latter of which reveals a remarkably sympathetic understanding of child life. These little poems seem not merely poems to a child or for a child, but by a child; and they show in delightful fashion what must have been the pleasures of Stevenson's lonely childhood.

The most notable of his productions during the Samoan period were *The Master of Ballantrae*, another story of Scottish life; *David Balfour*, a sequel to *Kidnapped*; and the uncompleted romances *St. Ives* and *Weir of Hermiston*, this latter regarded by many critics as Stevenson's greatest work.

His Place in Literature. Stevenson is one of the most fascinating personalities in the history of English literature, largely because of the courage which helped him to work diligently, uncomplainingly, and even cheerfully, in the face of great difficulties. Those who knew him personally found it hard to judge fairly of the writer, because of the charm which the man exerted. He ranks high, however, by reason of his

artistic, delicately wrought style, and his power as a romance writer, second not even to that of Scott. The charm of his first romance, *Treasure Island*, with



Photo: O & O

A MEMORIAL TO STEVENSON

A sculpture by Saint Gaudens, depicting the last days of the writer. It may be seen in the Church of Saint Giles, in Edinburgh.

its unfailing fascination for young and old, is aptly set forth in these lines of Bert Leston Taylor's:

Comes little lady, a book in hand,
A light in her eyes that I understand,
And her cheeks aglow from the faery breeze
That sweeps across the uncharted seas.
She gives me the book, and her word of praise
A ton of critical thought outweighs.
"I've finished it, daddie!"—a sigh thereat.
"Are there any more books in the world like that?"
No, little lady, I grieve to say
That of all the books in the world to-day

There's not another that's quite the same
As this magic book with the magic name.
Volumes there be that are pure delight,
Ancient and yellowed, or new and bright;
But—little and thin, or big and fat—
There are no more books in the world like that.

STEWART, CORA WILSON. See MOON-LIGHT SCHOOLS.

STEWART RIVER. See YUKON RIVER.

STERE, steer. See METRIC SYSTEM (The Unit of Volume).

STEROPE, slehr' o pe, one of the Pleiades (which see).

STHENO, sthe' no, one of the sisters of Medusa (which see).

STIBNITE, stib' nite. See ANTIMONY.

STICK, a term in printing. See PRINTING (The Process).

STICK BUTTON. See BURDOCK.

STICKLEBACK, stik' 'l bak, a name applied to a family of small fishes of the northern hemisphere, so called because some of their fins are replaced by strong, sharp spines, the



THREE-SPINED STICKLEBACK AND ITS NEST

number of which is important in their classification. Instead of having scales, the body usually possesses a series of hard plates. There are both fresh-water and ocean species, the former attaining a length of from two to four inches, and the latter, of not more than seven. These fish have the peculiar habit of building muff-shaped nests of sticks and roots for receiving the spawn. The male carefully guards the spawn, and he also watches over the young for several days after the eggs are hatched. Sticklebacks feed voraciously on the young fry of other fishes. L.H.

Scientific Name. Sticklebacks comprise about a dozen species of the family *Gasterosteidae*. The three-spined stickleback is *Gasterosteus aculeatus*.

STICKSEED, a tall, hairy-stemmed weed of the borage family, so named because its fruit, a small, dry nut, has rows of sharp bristles that stick to the clothing of people and to the

fur or hair of animals. The plant grows in dry soil quite generally throughout North America, from the Mexican border northward. It has slender branches, gray-green leaves, and small blue, white, or lavender flowers. The stickseed is a persistent weed, and can be eradicated only by patient digging and cultivation. B.M.D.

Scientific Name. The botanical name of the stickseed is *Lappula virginiana*; it belongs to the family *Boraginaceae*.

STIGMA, in botany. See FLOWER (Flower Structure).

STIKINE, stih keen', RIVER, a Canadian stream, the chief waterway from the Pacific Ocean into the interior of Northern British Columbia. The Stikine flows into the Pacific Ocean through the narrow southern projection of Alaska, which shuts off a large part of British Columbia from the sea. It rises in Canada, on the west slope of the Cassiar Mountains, in British Columbia, and describes an irregular semicircle in its course, running first northward, then westward, and finally curving gradually to the south. The river is 335 miles long, and drains a basin of approximately 20,000 square miles. In summer there is steamer service on the river as far as Telegraph Creek, which is about 170 miles from its mouth.

STILE. See SUNDIAL.

STILL. See DISTILLATION.

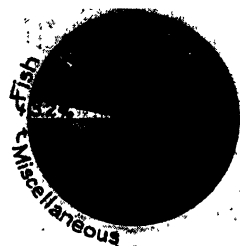
STILL, DR. TAYLOR ANDREW (1828-1917), the founder of osteopathy (which see).

STILLWATER, MINN. See MINNESOTA (back of map).

STILT, a wading bird having long, slender legs which give it the odd appearance of walking on stilts. The stilts are related to the avocets, and are found in both the eastern and the western hemispheres. The *black-necked*

stilt, the only American species, is a handsomely marked bird about fifteen inches long, with white under parts, black upper parts, and bright-red legs. It builds its nest by lining a slight depression in the ground with grasses. The eggs are three or four in number, and are of an olive or buffy color, thickly spotted with chocolate tones. The bird frequents shallow ponds in fresh and salt marshes, and feeds on water insects and other aquatic forms. It is found in Western and Southern United States and southward. See illustration, page 6835. D.L.

Scientific Name. The stilts belong to the family *Recurvirostridae*. The black-necked stilt is *Himantopus mexicanus*.



FOOD OF THE STILTS

STILTS. Every one is familiar with the long walking sticks with foot rests, used by boys in their play, which enable them to cover the ground with very long steps. It is inter-



BLACK-WINGED STILT

This species is not found in America, but is seen in the British Isles. (See page 6834.)

esting to know that in some sections of Europe, particularly in Belgium and France, the peasants use stilts regularly when the lands are flooded. These practical stilts are strapped securely about the leg below the knee, and the walker uses a long pole to help him maintain his balance.

STIMSON, HENRY LEWIS (1867-), an American lawyer, Secretary of State in President Hoover's Cabinet. He was born in the City of New York, of an excellent family, his father, Lewis Atterbury Stimson, being a surgeon of distinction. Henry Lewis attended private school and Yale University, receiving his A.B. degree from the latter in 1888. The following year, he obtained the M.A. degree at Harvard, and then entered the Harvard Law School. In 1891 he was admitted to the bar in New York, where he subsequently practiced his profession. He gained a reputation for ability, industry, and integrity, and for the fairness which he always showed in trying cases, having been described as "a living refutation of the notion that an attorney must be sharp, even crooked."

Stimson served as United States attorney for the southern district of New York from 1906 to 1909, and was Secretary of War in the

Cabinet of President Taft, 1911-1913. During the World War, he served in France as lieutenant colonel of the 305th Field Artillery, and as colonel of the 31st Field Artillery.

In 1927 he went to Nicaragua as special representative of President Coolidge, to ascertain the causes of internal dissensions. He found that election frauds were the basis of the trouble, and recommended that the United States take steps to guarantee an honest election. The results seem to have substantiated his views.

From 1927 to 1929, Stimson served as Governor-General of the Philippines, and pursued there the lines of policy followed by General Wood. Early in 1929, he was recalled to the United States to assume the highest post in the Hoover Cabinet. In that capacity, he was especially identified with the movement for reduction of naval armaments, and was a delegate to the London conference in January, 1930. See **HOOVER**, **HERBERT CLARK**.

STINGAREE, *sting a re'*. See **STING RAY**.

STING RAY, also known as **STINGAREE**, a ray whose most striking characteristic is the possession of a long, flexible tail with sharp spines on the back. These spines have cutting teeth along the edges. When irritated, the sting ray swings its tail upward and sideways, inflicting a most painful wound. The fish are found most abundantly in warm, shallow parts of the ocean, where they live on sandy or silty bottoms. They have a flattened, disclike body, and may reach a length of ten or twelve feet.

L.H.

Classification. Sting rays belong to the family *Dasyatidae*. There are about fifty species. The common sting ray is *Dasyatis centroura*.

STINKHORN. See **MUSHROOMS**.

STINKWEED. See **STRAMONIUM**.

STINNES, stin' nes, **HUGO** (1870-1924), a German industrial dictator and financier. He became one of the world's richest men, largely through his business enterprises, but also as a result of the steady depreciation of German currency in the chaotic period following the World War. Through financial maneuvers, he prevented the stabilization of the mark, returning the money he had borrowed, in inflated paper. See the article **GERMANY** (Germany and the World War).



Photo: Keystone

HENRY L. STIMSON

Born at Mülheim, Germany, Stinnes was the son and grandson of practical Ruhr shippers and coal merchants. Educated at a *realschule* (preparatory school which lays chief emphasis upon mathematics, science, and the modern languages, but includes Latin), he later entered an office for business training, and then a colliery for mining experience. In 1889 he took a course at the Academy of Mines, Berlin.

When twenty-two, Stinnes established his own organization, and devoted the remainder of his life mainly to business. His genius lay in his ability to promote industrial and financial combinations, and he kept unceasingly at work, relentless and tyrannical in the perfecting of his schemes. His interests were first primarily concerned with coal and its mining, and with shipping, but the World War gave him an opportunity to enlarge the scope of his activities. He became owner and controller of mines, factories, steamship lines, railroads, newspapers, hotels, and theaters, extending his operations to foreign countries, as well as to Germany.

A man of simple tastes, he lived modestly and spent but little of his great wealth. In 1920 he was elected to the Reichstag, but his influence there was negligible. He did not understand people, and could not gauge public opinion. Only in the field of business was he supreme. In 1921 he supported a movement to create a sort of super-trust to control every great industry in Germany, and to regulate production, transportation, and the supply of German markets, as well as those of the entire world. Such a plan gave him an opportunity to exercise his organizing ability, but he died with his ambition unrealized. After his death, his son allowed the business to decline, and by 1925 reorganization of the business left only forty per cent of the stock in possession of the family.

STIRLING RANGE. See WESTERN AUSTRALIA (Physical Features).

STOAT. See ERMINE.

STOCK, CAPITAL. What is known in the business world as *capital* is the money, lands, buildings, equipment, etc., employed in a commercial enterprise. If only two or three people are associated in such an enterprise, a *partnership* is likely to be formed; and the evidence of each partner's share in the business is contained in a partnership agreement. If, however, the business is large and the capital is a sum so great that many partners are required, an arrangement so simple is not possible. In such event, a *corporation* is formed, and the capital is divided into small sums called *shares*.

Each share may be in face (par) value any sum determined upon—\$10, \$25, \$50, \$100, or even more. The usual amount in great

enterprises is \$100. Since 1912 some states, notably New York, have permitted corporations to issue stock without par value. Each investor, when he puts money into the enterprise, receives a certificate from the company. This states that he is a *stockholder* to the extent of the number of shares named in the certificate; naturally, this paper is called a *certificate of stock*, or a *stock certificate*.

A certificate of stock does not specify what the owner pays for it. One share whose face value is \$100 may have cost just that sum; if so, it was bought *at par*. Just to the degree that the corporation is prosperous or is a losing concern, the stock sells at prices above or below par. Owners of stock in a corporation cannot be assessed for debts of the corporation. Failure of the business enterprise may render their stock worthless, but they cannot be made otherwise to suffer financially.

Dividends are sums distributed to stockholders from the profits of the enterprise. A dividend on stock may be compared to interest on a loan, except that the former is uncertain, while interest is a fixed sum. If stock pays six per cent in a certain year, the dividend is \$6 on each \$100 share; if some holders purchased their stock at 50 (one-half par value), the return on their investment is twelve per cent; if they paid 120 (one-fifth above par), the actual income from their stock is five per cent.

Every stockholder is a participant in the business, though he is not known as a partner. He has the right to vote for those men, also shareholders, who shall give of their time to the oversight of the enterprise. Such managers form the *board of directors*. This board is directly responsible to the investors for the conduct of affairs, and it is given the privilege of choosing the officers in whose hands responsibility of management rests. The officers—president, vice-president, secretary, treasurer, etc.—are responsible to the board. In elections to the board of directors, each man's voting power is proportionate to the number of shares he owns. If one man owns fifty-one per cent of the stock, he can outvote all the other members combined and control elections; this is fair to all, as his investment is largest and he has most at stake. Any stockholder who objects to the exercise of this power need not retain his stock; he may dispose of it as soon as a buyer can be found. E.J.

Watered Stock. When a corporation announces an increase in the number of its shares or securities without having a corresponding increase in the assets of the company, its stock is said to be "watered." This action results in a fictitious showing as to the amount of capital employed, and the actual value of the shares is "diluted."

Classification of Stock. A corporation usually issues two kinds of stock, common and

preferred, which carry with them specific rights and privileges, indicated on the stock certificate.

Common Stock is the designation given to stock which has no financial preference as to dividends; possession of such stock allows the holder to share in the profits whenever the directors see fit to declare dividends. The dividends may be large or small, depending upon the prosperity of the business and the judgment of the directors. Common stock is considered speculative, because the amount of income from the investment is not definitely stated.

Preferred Stock. This term denotes shares that bear a fixed rate of dividend which must be paid before any earnings may be declared on the common stock. Another special privilege of preferred stock is that the dividends may be cumulative or non-cumulative. In the case of cumulative preferred stock, if the dividends are not paid when due, they accumulate, and must be paid out of future profits before any dividends are paid on the common stock. In case of non-cumulative preferred stock, the dividend must be paid out of the earnings of each year. Preferred stock is bought for the investment, and does not have the speculative features of common stock.

Treasury Stock is capital stock which has been duly issued and sold, but which has reverted back into the hands of the corporation, either by purchase or donation. In some states, a corporation may not buy its own stock, for the very purpose of that type of organization is to have the stock owned by many. However, when corporations allow their employees to buy stock, or present them with shares in recognition of service, etc., they usually agree to buy back the stock, should the employee leave the company. This stock would become treasury stock, and would be held until sold. The common stockholders sometimes agree to donate a number of their shares to the corporation, to provide funds for a new development. Stock acquired in this way also becomes treasury stock. E.U.G.

Related Subjects. The reader is referred to the following articles in these volumes:

Commerce
Corporation

Partnership
Stock Exchange

STOCK, FRÉDÉRICK A. (1872-), a violinist, composer, and conductor of the Chicago Symphony Orchestra. He was born at Jülich, Germany. His early musical studies were under the direction of his father, a bandmaster in the German army. Later, he entered the Cologne University, continuing with his musical training; after graduation, he took up seriously the study of theory and composition. In 1895 Stock removed to Chicago and joined the Chicago Orchestra as viola-player. Four

years later, he was appointed assistant to Theodore Thomas, then its director. Subsequently, he conducted concerts given by this organization outside of Chicago, and upon the death of Thomas, in 1905, succeeded to its conductorship. The organization, known then as the Theodore Thomas Orchestra, is now the Chicago Symphony Orchestra. After the World War, Stock became a naturalized American citizen, and in 1919 was decorated Chevalier of the Legion of Honor (France).

In harmonization and orchestration, Stock belongs to the latter-day German school. He has written many works in the larger forms—overtures, symphonic poems, and symphonic variations, which have frequently been played in Chicago. Among his compositions are *Symphony in C Minor*, *Psalmody Rhapsody* for chorus and orchestra, a tone poem for a large orchestra, a concerto for violin and orchestra, and two overtures, *Festival March* and *Hymn to Liberty*. His symphonic poem, *Life*, was composed in memory of Theodore Thomas. He also wrote an elegy, *Hymn to Democracy*, and numerous string quartets and songs.

STOCKBRIDGE INDIANS. See INDIANS, AMERICAN (Most Important Tribes: Mohican).

STOCK EXCHANGE, an association of men who buy and sell stocks of railroads and other great industrial enterprises. The name is also applied to the building in which the association conducts its business. The same reasons which justify the existence of a board of trade may be applied to a stock exchange. When a man wishes to buy or sell shares of a certain stock, there should be some convenient place where the transaction may be made. Many years ago, in London, before regular stock exchanges existed, a man desiring to purchase or dispose of stocks went to a well-known coffeehouse (somewhat like a modern restaurant); he knew that brokers, well informed in such business, were in the habit of congregating there, and for a small commission one of them would act as his agent in the transaction. In 1801 these brokers organized a buying and selling association, and called themselves, appropriately, a stock exchange.

How Exchanges Became Stable. In the development of such a business, many alterations in policy were inevitable. The early exchanges executed commissions in connection with any kind of stock that existed; there was no discrimination between the shares of strong, conservative enterprises and those which were of doubtful value. Finding it to be against public policy to recognize questionable stock and give it official approval equally with that which had proved value, stock exchanges eventually began to limit the number of enterprises whose shares should be recognized. To-

day, a "listed" stock is one which is dealt in on the stock exchanges; so far as the exchanges are concerned, any stock they do not list as entitled to their recognition does not exist. Before a company's stock can be listed, its officials must satisfy the exchange that it has paid-up capital, that it is a legitimate enterprise, and that it is in good financial condition. A balance sheet of the company is carefully scrutinized by the board of control of the exchange; then the stock is listed or the application is rejected.

It will be noted at once that many stocks are quoted on the exchanges every day at prices which mark them as extremely undesirable, if not almost worthless. Such a condition did not exist when they were first admitted to the exchange lists; circumstances which possibly could not have been avoided may have lessened the earning power, and thus lowered the price people are willing to pay for shares. Prosperous times or more intelligent management may advance values, or suspicion may force them still lower, but, in justice to hundreds of innocent holders of stock, the shares remain listed, so that their market value may at all times be known.

If a company is able to pay four or five per cent on its capitalization per year, its stock sells on the exchanges at about its face value, or *at par*. If its earning power increases until it can pay eight or ten per cent a year, people are willing to pay more than face value; if the stock is purchased even at a premium, the investor will get a good income. So great is the earning power of some corporations that their stock is worth from \$500 to \$900 for every \$100 share, but should disaster overtake them, and little hope exist that prosperity would return again, those same shares might sell for \$10 each. During the World War, the Bethlehem Steel Company made excessive profits from the manufacture of war munitions; people were so anxious to purchase its stock that the price advanced for a time to \$575 per share.

In illustrating the functions of exchanges, stocks only have been mentioned. In addition, stock exchanges now deal in the bonds of corporations whose stock they list, although they have not always done so. For many years, the New York Stock Exchange limited its activities solely to railroad stocks and bonds.

All great daily papers, in their market reports, print quotations and sales of stocks and bonds. Young people will learn much of value if they consult these lists frequently. They serve somewhat as a business barometer. Soon, with the help of the news columns of the papers, one will be able to know why certain stocks are high and others are low.

Memberships. Because an exchange limits its membership practically to the number of men who can easily care for the business

within its sphere of influence, memberships have become worth large sums of money. Their value depends in a large measure upon the prevailing state of business and the market level of securities. The price of a seat on the New York Exchange has varied from \$20,000, during a period of national depression, to as high as \$600,000 in the most prosperous years. In other market centers, the prices range from \$1,500 to \$100,000.

No man can purchase a membership and thereby become entitled to the privileges of his exchange; he must be formally recommended and then elected. If a member dies, his membership becomes the property of his heirs, but such transfer does not carry membership rights. The new owner must be elected to a seat, or the membership must be sold and the purchaser must secure election. If, on a member's death, he is indebted to other members of his exchange, the proceeds of the sale of his seat must first be applied to the cancellation of debts; any sum remaining belongs to the beneficiary.

The "Curb." How are unlisted stocks and bonds marketed, and how are their prices known and regulated, if stock exchanges refuse to recognize them? There are scores of companies whose unlisted stocks are on the market, and there is an immense amount of trading in them, in spite of their highly speculative character.

Such purchases and sales are made by what is known as *curb trading*. The name originated in the old custom of carrying on such trading in the streets or on the curbs. If brokers and customers were barred from the stock exchanges, they gathered outside the buildings or as near to them as possible. Sometimes there would be a wildly gesticulating crowd of a thousand men on the curb in a great city. At present there are curb exchanges in most of the cities having regular associations, but these curb exchanges operate inside of buildings, and the curb in New York is located in its own building. Daily newspapers report their transactions as fully as those of the regular exchanges.

F.H.E.

Related Subjects. The following articles in these volumes should be read in connection with the above:

Board of Trade	Capital
Bucketshop	Corporation
	Stock, Capital

STOCKHOLDER. See STOCK, CAPITAL.

STOCKHOLM, the capital and metropolis of Sweden and the chief industrial center of that country. It is picturesquely situated on the shores of Lake Mälär, at the point where the lake is drained by a small stream into a channel of the Baltic Sea. A part of the city occupies a network of islands and peninsulas, and for this reason it is sometimes called "the Venice of the North." Yet there is nothing



AIRPLANE VIEW OF THE CITY OF STOCKHOLM

Photo: O R O G

6839

else about this interesting capital, with its characteristic northern scenery, its rocky hills, and virgin forests, to suggest the tranquil beauty of an Italian city. The old nucleus of Stockholm, called the *Staden*, which was founded by Birger Jarl about 1255, is built on an island in the stream; it is a place of nar-

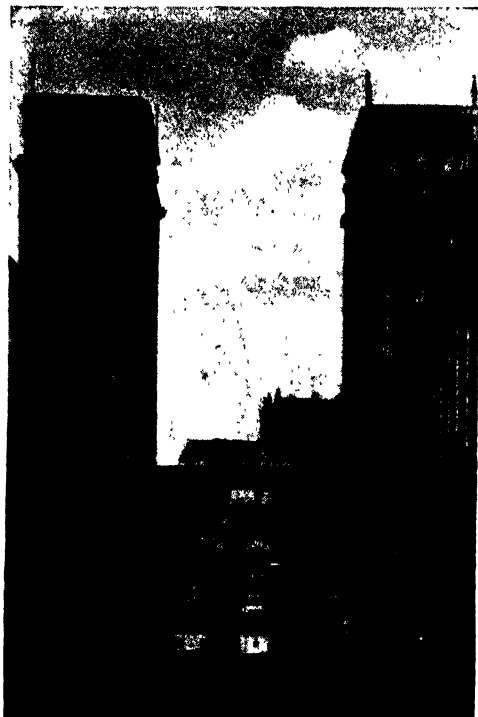


Photo: O R O C

IN STOCKHOLM

The fifteen-story buildings are declared to be the tallest structures on the continent of Europe.

row, winding streets and quaint gabled houses, but the sections on the north and south shores of the mainland have broad, modern avenues, and many handsome squares, promenades, parks, and public buildings.

Stockholm is the chief intellectual center of Sweden. It possesses an excellent system of elementary schools, several higher technical institutions, the Royal Library, museums of fine arts, many scientific and historical academies, and an astronomical observatory. Near the observatory are the offices for the distribution of the Nobel Prizes (which see).

Stockholm manufactures beer, sugar, cotton goods, tobacco products, furniture, soap, food-stuffs, and other commodities. Shipbuilding is an industry of importance. Connected by canal with the Baltic Sea, Stockholm ranks next to Gothenburg as a shipping center. The harbor was recently enlarged, and in 1926 a new dock was completed, capable of accom-

modating the largest ships. Population, 1928, about 465,000.

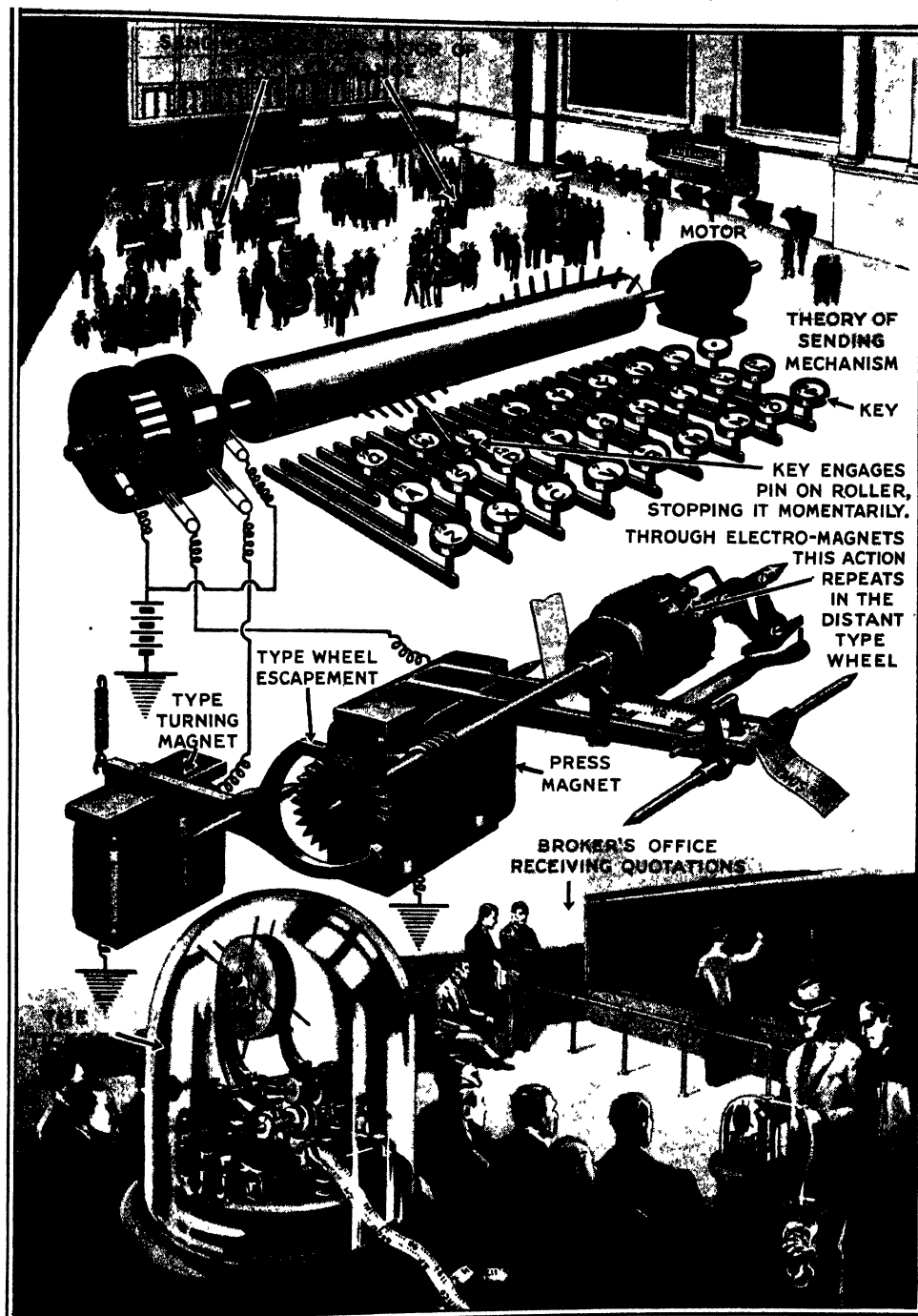
STOCKS, an instrument of punishment for petty offenders, formerly used in Great Britain and other European countries; and in the American colonies, especially in New England, in the eighteenth century. The stocks consisted of a wooden structure, with a bench on which the culprit sat, with his legs outstretched and his ankles confined in holes between heavy boards, the upper one of which was movable and could be locked in place. Sometimes the stocks included a pillory (which see). Confinement in the stocks was usually for several hours at a time, and besides causing physical discomfort, it made the culprit an object of public ridicule. The use of the stocks in Britain dates back to Anglo-Saxon times. The Statute of Laborers, a law of 1350, provided this punishment for unruly artisans, but inebriates were the usual victims. At one time, practically every English village had its stocks, and specimens of the apparatus may still be seen in some places, occasionally with a whipping post attached (see illustration under **CRIME**). The stocks fell into disuse in England early in the nineteenth century. In the Southern states, the stocks were formerly used as a punishment for slaves; and in early New England, a common scold was sometimes condemned to suffer the obloquy of this uncomfortable exposure to the public gaze. See **PILLORY**; **WHIPPING POST**.

STOCK TICKER, an electric machine that prints stock quotations on a paper ribbon. In popular language it is called the *ticker*, and the ribbon is the *tape*. The ticker operates on the principle of the telegraph. It was invented in 1867 by E. A. Calahan, who had been connected with the American Telegraph Company. Prior to its appearance, information about prices was transmitted by mail or messenger—both very slow and unsatisfactory methods, in comparison with the swiftness of the telegraph.

There are 13,500 stock tickers in use in the United States. Of this number, 7,500 are employed to furnish the prices of the New York Stock Exchange, and 6,000 are maintained by the Western Union Telegraph Company, for the accommodation of other exchanges and to record the transactions of the curb market.

The use of the ticker may be shown by an example. Suppose that a customer in Detroit orders from his broker shares of a stock that can be bought only on the New York exchange. The Detroit broker wires the order to a firm in New York. That office telephones the order to its trader on the floor of the exchange. The latter goes at once to the trading post where that stock is being marketed, calls out his order, and buys the stock. As soon as the trade is completed, a clerk takes down the

The STOCK TICKER *at* WORK



name of the stock, the number of shares, and the price. He carries this information to one of several places on the floor where trades may be recorded. At this point, there is a man with a machine which resembles a typewriter. The report is written by the operator, and in this process the characters are transmitted electrically to a control machine that prints all the transactions in the order of their reception. From this control machine the symbols are sent to the main machinery room, located in the basement of the exchange, and from there they are sent out to the tickers in all parts of the country.

The report of this trade will appear on the ticker in the office of the Detroit broker a few minutes after the customer placed his order—probably four or five minutes are sufficient to complete the entire transaction. From the standpoint of a simple purchase, this degree of speed is probably all that could be asked.

However, there is one phase of the ticker's work for which it has been far too slow. Within recent years, the volume of stock-trading has so increased that the ticker has not been able to keep pace with it. On the days of the heaviest trading, when several millions of shares were dealt in, the ticker was sometimes an hour or two behind the market. At such times, the business of the exchange temporarily disappeared from view, and the "priceless news of prices" could not be obtained.

To remedy this condition a new ticker was devised which has double the speed of the former machine. The installation of the equipment necessary to operate the new system required the expenditure of \$2,000,000 by the New York Stock Exchange, and a still larger amount by the Western Union. This huge outlay was fully justified by the importance of getting information about the market, with promptness and certainty, to the investors of the country.

The present highly developed form of ticker is able to print 80,000 characters a day. In an effort to increase the amount of information which it can communicate, changes have been made in the symbols of which quotations are made up. These changes were for the purpose of reducing the number of characters indicating a given stock. For example, United States Steel was formerly known as *US*. Now it is simply called *X*, one letter instead of two. Many such changes have been made, and have resulted in considerable saving of time, by increasing the stock ticker's capacity. See *STOCK EXCHANGE*; also *TELEGRAPH* (Printing Telegraph). E. U. G.

STOCKTON, CALIF., the county seat of San Joaquin County and one of the leading manufacturing cities of the state. It is situated at the head of tidewater navigation on the San Joaquin River, about forty-eight miles

southeast of Sacramento and eighty miles east of San Francisco. Lying at the junction of the San Joaquin and Sacramento valleys, Stockton is one of the largest grain, vegetable, and fruit markets of the West. Population, 1928, 51,000 (Federal estimate).

Stockton occupies a level site and is known as a city of beautiful homes and gardens. Over 600 miles of paved highways radiate from the city, leading to a vast recreational region, including Yosemite, Tahoe, Wawona, and Calaveras groves of Big Trees, and the famous gold-mining region of '49 fame. Another point of interest is "the Valley of the Moon," made famous by Jack London, the California novelist. Twelve public parks are located within the city.

Transportation. Nearly 400 miles of navigable waterways connect with Stockton and a ship channel which has been dredged to permit ninety per cent of the ocean-going vessels to dock at this port. The railroads serving the city are the Atchison, Topeka & Santa Fe, the Southern Pacific, and the Western Pacific. In addition, there are three interurban lines, as well as motorbus service and a regular steamer line carrying passengers and freight between Stockton and San Francisco.

Industries. Among the important products of Stockton's varied industries are flour, cereals, leather, window glass, paper products, wall board, motor boats, road-building machinery, bricks, radio apparatus, agricultural machinery, cedar-pencil slats, and canned fruits and vegetables. To the north of the city is a district, ten miles square, which is devoted to vineyards and orchards. The San Joaquin River delta produces immense crops of potatoes, corn, asparagus, and grains.

Institutions. The College of the Pacific occupies a site of fifty acres, and has carried out a new building program costing approximately \$750,000. In the city, also, are Saint Mary's College, Saint Agnes Academy, Saint Joseph's Home for the Aged, and the Pacific and state hospitals. The new civic auditorium, with a seating capacity of 5,000, was built as a memorial to the soldiers of the World War.

History. Stockton is the oldest settlement in the San Joaquin Valley. Founded in 1847, it was first called Tuleberg, and later New Albany. In 1849 a town was laid out, and the present name was adopted in honor of Robert Field Stockton, who was instrumental in gaining possession of California for the United States, during the war with Mexico. Because of its strategic position, Stockton became an important outfitting post for the gold-seekers of '49. Stockton was made the county seat and chartered as a city in 1850. The commission form of government was adopted in 1911.

STOCKTON, FRANCIS RICHARD (1834-1902), a popular American writer of humorous stories, called by a contemporary admirer a "wonderful weaver of fancies" and—

"A King of the Kingdom of Laughter
And a Prince, but never of Walls."

The stories of Frank Stockton, as he is usually called, are enjoyed for their whimsical humor, unusual characters and situations, and attractive style. Their author spent his early life in his native city of Philadelphia. Although he showed literary ability by writing verses at the age of ten, and by contributions to his high-school paper, he became a wood engraver and designer after completing school. He began his professional literary work in 1866, when he became a reporter on the *Philadelphia Morning Post*. Later, he joined the staffs of the *Hearth and Home* and *Scribner's Monthly* of New York, and in 1873 became assistant editor of *Saint Nicholas*. After 1899 he lived at Claymont, in the Shenandoah Valley, near Charlestown, W. Va., an estate formerly owned by the Washingtons and planned by the first President. He died at Washington, D. C.



Photo Brown
FRANK R. STOCKTON

When he wrote *The Lady or the Tiger?* he created a situation the like of which probably never confronted any other author. He could not bring the story to a close because he was unable to decide whether the lady or the tiger should come through the doorway.

Career as a Novelist. After seven years of editorial work, Stockton began to write independently. In 1879 his most popular story, *Rudder Grange*, appeared, and firmly established his fame among American humorists. Among other stories are *The Lady or the Tiger?* his best-known short tale, which has been translated into several other languages; *The Christmas Wreck and Other Stories*; *The Casting Away of Mrs. Lecks and Mrs. Aleshine*, and its sequel, *The Dusanter*; *The Beeman of Orn*; *The Hundredth Man*; *Pomona's Travels* (a continuation of *Rudder Grange*); *The Adventures of Captain Horn*; *Mrs. Cliff's Yacht*; *Afloat and Ashore*; *The Girl at Cobhurst*; and *Ting-a-Ling Stories*, a collection of tales for children.

STOCKTON, RICHARD (1730-1781), an important aid to the colonies during the Revolutionary War. A statue of Stockton, by Henry Kirke Brown, is a gift of the state of New Jersey to Statuary Hall, Washington, D. C. Born near Princeton, N. J., he was a graduate of the College of New Jersey (Princeton), and was admitted to the bar in 1754. In 1774 he was judge of the Supreme Court of New Jersey. At first, Stockton advocated reconciliation between the colonies and Great Britain, but later actively opposed the British Ministry. As a member of Congress, in 1776, he was one of the signers of the Declaration of Independence. See STATUARY HALL.

STOCKYARDS AND PACKERS ADMINISTRATION. See AGRICULTURE, UNITED STATES DEPARTMENT OF.

STODDARD, RICHARD HENRY (1825-1903), an American poet, essayist, and critic, born at Hingham, Mass., the son of a sea captain.

While he was still a boy, the family moved to New York, and he attended a public school there, later studying law. After working for a time in a newspaper office, he learned the trade of a blacksmith, and then that of an iron-molder, at which he worked for several years. In 1849 he produced a volume of poems, *Footprints*, and from that time published frequently both prose and verse.

From 1853 to 1870, Stoddard had a place in the New York custom-house; from 1880 until his death, he was literary editor of the *Mail and Express*, a New York evening paper.

His Writings. Delicacy and sincerity are the chief characteristics of his writings, which include *Songs of Summer*, *The King's Bell*, *The Book of the East*, and *Under the Evening Lamp*, besides biographies, juvenile books, and editions of the works of other poets.

STOICISM, *sto' ih siz'm*, belief in the doctrines of Zeno, who was called "the Stoic philosopher," because he gave his lectures in a public porch, called *stoa* in Greek.

Zeno founded his school of philosophy in the latter part of the fourth century B. C. Its teachings were lofty and severe. At a time when the followers of Epicurus were telling the people of Athens that pleasure is the chief end of existence, the Stoics taught *virtue*, for its own sake, as the highest good. Because it was a pantheistic philosophy, contending that all reality, though material, is animated by God or reason, with which the soul of man is identified, happiness to the Stoics meant living in harmony with the divine order, with each accepting his destiny uncomplainingly. It was thus a practical philosophy, its followers practicing self-control, courage, temperance, and justice, and repressing all emotion arising from pain or misfortune. One of their doctrines that has had a marked influence on the thought of the world, being embodied in many a modern political creed, was that every human being is part of the same "world soul"—a *universal brotherhood* that should dwarf all difference of rank and nationality. It was this principle, also, that helped to prepare the world for the acceptance of Christianity.



Photo: Brown Bros.
RICHARD HENRY STODDARD

The Stoic philosophy made a strong appeal to the Romans, and Epictetus became the founder of the New Stoic school, to which belonged also such great thinkers as Seneca, Cicero, and Marcus Aurelius, "the flower of Stoicism."

Related Subjects. In connection with this discussion of Stoicism, the reader is referred in these volumes to the following articles:

Aurelius, Marcus	Philosophy
Epictetus	Seneca
Epictetus	Zeno

STOLA, the outer garment of the ancient Roman matrons, worn over the tunic. It was very full, and was gathered in at the waist by a girdle, falling in soft folds to the ankles or feet. The stola was frequently ornamented at the throat by a Grecian or colored border, and was fastened at the shoulder by a fibula, or ornamental brooch. To complete the Roman costume, the palla, a loose mantle, was draped over the stola in a shawl-like effect. Women who had been divorced from their husbands were forbidden by law to wear the stola. See **TUNIC**.

STOMACH, *stum' uk*, a dilation of the alimentary canal below the oesophagus. It is a somewhat J-shaped muscular sac, located in the upper left side of the abdominal cavity. It presents a *body*, with an enlarged upper end which connects with the oesophagus. The body is extremely variable in shape, and is continuous with a constricted lower portion known as the pylorus, which leads into the small intestine.

The stomach varies in form and size, especially according to the amount of food which it contains. When nearly empty, it presents throughout a narrow, tubelike form. When filled with food, it may be distended to considerable limits. The average capacity of the stomach is one liter (a liter is 1.056 liquid quarts). The stomach also varies in form and position according to the general physique of the individual. Tall, thin people have long, narrow stomachs, while short, stocky people have stomachs that are shorter and wider. The position of the stomach varies in different individuals, and in the same individual according to changes in physiological condition, distended posture, etc.

The stomach plays an important part in digestion. Its functions are the following:

- (1) To reduce the food to a viscid, pulpy liquid.
- (2) To begin the digestion of proteins.
- (3) To supply *hydrochloric acid*, which is believed to assist in dissolving the food, to prevent bacterial action in the stomach, and to act as a stimulus to the secretion of the digestive juices in the small intestine. This latter function is being seriously questioned in very recent work done by physiologists.
- (4) To pass the food on to the intestines in comparatively small quantities, at short intervals.

The stomach accomplishes these functions in the following ways: The food is introduced into the stomach at its upper end, from the oesophagus. By means of the powerful muscles with which the stomach is supplied, rhythmic contractions are set up which start at the upper end and pass in ringlike formation toward the lower end. This does two things: It propels the food toward the pyloric end of the stomach, and it also reduces the food to a pulpy mass. These contractions occur at regular intervals of about twenty seconds, and are known as *peristaltic waves*; when the stomach is empty, it is these contractions that first make us conscious of a sense of hunger. When the food reaches the pyloric end of the stomach, it is prevented from going farther by a sphincter. This sphincter opens only at certain intervals, when the food is ready to be passed on to the intestines. The time taken to empty the stomach varies with different individuals and according to the type of food eaten. Liquids require little preparation by the stomach, so that the sphincter lets them through almost immediately after ingestion. On a mixed diet, most stomachs are empty in three hours.

Diagrammatic section through coats of stomach, highly magnified.

- (a) Duct of gastric gland
- (b) Mucous membrane
- (c) Muscular coat of mucous membrane
- (d) Submucous coat
- (e) Circular muscles
- (f) Longitudinal muscles

When the food is in the stomach, in addition to being mechanically reduced to pulp, it is acted upon by the *gastric juice*. This juice is a whitish fluid secreted by glands in the stomach, and contains water, salts, mucus, hydrochloric acid, and two ferments—*pepsin* and *rennin*. So far as is known, *rennin* acts only on milk, while *pepsin* begins the digestion of



the proteins. This digestion is incomplete, and the process is carried on to completion in the small intestine. Carbohydrates and fats are not acted upon in the stomach. Thus it will be seen that probably the main function of the stomach is in its mechanical action on the food; and that the important digestive processes take place farther down in the alimentary tract.

Abuse of the stomach is the source of many ills to which the human race is subject. For suggestions about proper eating habits, consult the articles on LIFE EXTENSION and HEALTH HABITS.

K.A.E.

Related Subjects. The reader is also referred in these volumes to the following articles.

Abdomen	Intestine
Alimentary Canal	Pepsin
Digestion	Peptones

STOMATA, *sto' mah tah*. See LEAVES.

STONE. See ROCK.

STONE, as building material. See BUILDING STONE.

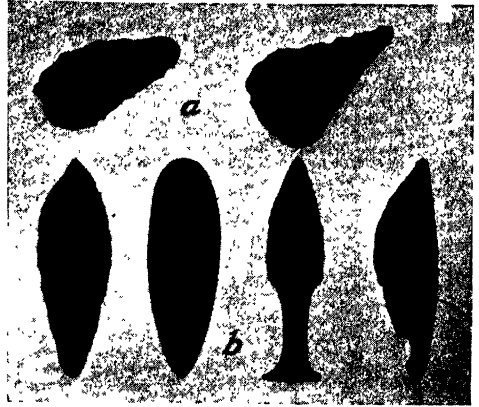
STONE, as paving material. See ROADS AND STREETS.

STONE, FRED ANDREW (1873-), an American comedian and eccentric dancer who has appeared in colorful musical shows beloved by children as well as adults. His stage experience began when, at the age of eleven, he gave a single performance in Topeka, Kan. Between 1886 and 1894, he was a member of a traveling circus, and later played Topsy in *Uncle Tom's Cabin*. In 1894 he met David Montgomery, with whom he formed a "team" that was very popular in vaudeville. The two continued their association in musical comedy until Montgomery's death. In 1903, as the Scarecrow in the *Wizard of Oz*, Stone was received with enthusiasm by the critics and public alike, and he maintained his popularity in *The Red Mill*, *Lady of the Slipper* (with Montgomery and Elsie Janis), *Chin-Chin*, *Jack o' Lantern*, *Criss-Cross*, and *Stepping Stones*. In the last-named, Stone's daughter Dorothy made her debut. Just before *Three Cheers* opened, in 1928, Stone was injured in an airplane accident, and his old friend Will Rogers (which see) took his place in the cast. Stone resumed his theatrical work in 1929, in the musical production *Ripples*.

STONE, NICHOLAS. See SCULPTURE (England).

STONE AGE, a period in the history of a people when they know nothing of metals, but use weapons and instruments made of stone, wood, bone, and horn. The term is descriptive of a stage in the development of the cultural attainments of a people, and represents a degree of civilization. Perhaps a few people in remote regions are still in their Stone Age—savages of the South Seas, Eskimos of the Polar regions—who use only the implements of the era long

passed by enlightened people. In Europe, men emerged from the Stone Age many thousands of years ago, when animals now extinct roamed the forests—the mammoth, the woolly rhinoceros, the cave lion, and the cave bear. In Asia and in Africa, the Stone Age came still earlier. All that is known of these people of other ages is learned from the relics that are found in caves and river gravel and burial mounds. There are axes and axhammers, knives, daggers, spear tips and arrowheads,



FLINT AND STONE IMPLEMENTS

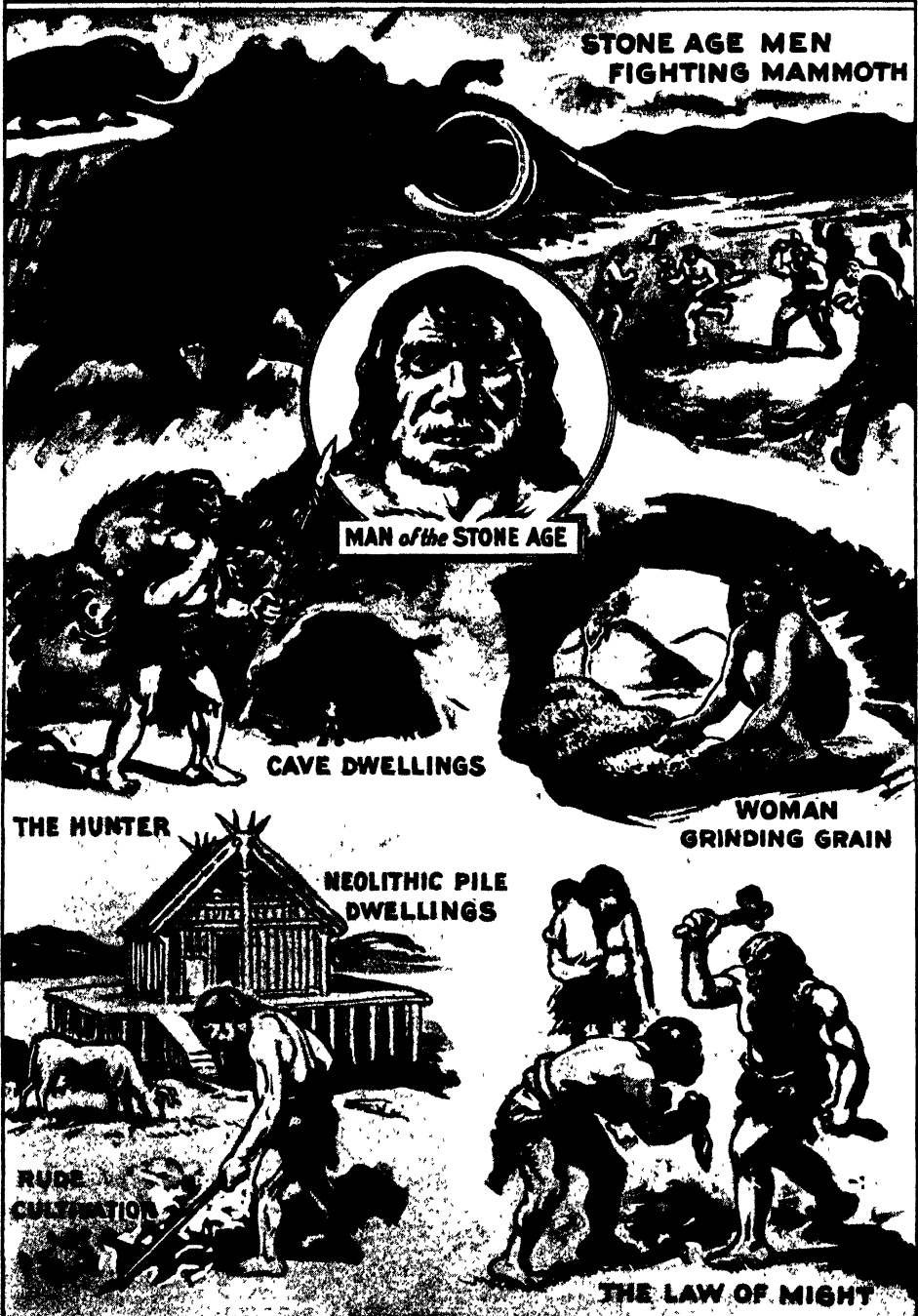
These were among man's earliest weapons. (a) Specimens of the Paleolithic period; (b) of the Neolithic period

saws, and chisels, the earliest ones of chipped flint, the later ones of polished stone. Carved bits of bone and horn are found with them, and sometimes very crude pottery. These races made striking paintings of men and animals on the walls of their caves. In the latter part of the Stone Age, the people lived in skin wigwams, herded cattle, sheep, and goats, and cultivated the land as primitive farmers.

Scientists divide the Stone Age into two divisions—the *Paleolithic* (Old Stone Age) and the *Neolithic* (New Stone Age). The former corresponds roughly to the geologic past, and is sometimes called "the age of chipped stone." The Neolithic is the period of highly finished stone implements. Generally speaking, the beginning of the Stone Age is estimated at about 100,000 B.C., and the end at 5,000 B.C., when the use of metals had its rise in Egypt and Chaldea. The best-known types of humanity living in the Paleolithic period were the Neanderthal men and the Crô-Magnons. The former were a squat, powerful, brutish, low-browed race. The Crô-Magnons, who were over six feet tall on the average, had a remarkably large cranial capacity; their brains were somewhat bigger than those of modern Europeans. See next page.

c.w.

LIFE *in the* STONE AGE



Literary Reference. Stanley Waterloo wrote a fascinating book called *The Story of Ab*, in which he described the life of a boy in the Stone Age.

Related Subjects. In this connection, the following articles in these volumes provide helpful material:

Age	Human Period
Bronze Age	Iron Age
Geology	Neanderthal Man

STONEBUCK. See STEINBOK.

STONECHAT, a small European bird of the thrush family, which takes its name from its peculiar note, a sound like that of two pebbles struck together. It is restless and active, and is usually found in open, grassy lo-



THE STONECHAT

cations, where it builds its nest on the ground, under a tuft of grass. The eggs are four to six in number, of a greenish-blue color, faintly spotted. The bird migrates in winter to Africa. It feeds on insect larvae, worms, beetles, and seeds. The stonechat is the blue titmouse of Ireland.

D.L.

Scientific Name. The scientific name of the stonechat is *Pratincola rubicola*. It belongs to the family *Turdidae*.

STONE FLY, an aquatic insect, so named because the larvae live in the water attached to the under side of stones. The stone fly is carnivorous, for it subsists largely on the nymphs of May flies.

STONEHENGE, *stone' henj*, an impressive prehistoric monument, consisting of a group of huge, rough-hewn stones. Stonehenge is on Salisbury Plain, in Wiltshire, England, a mile and a half from Amesbury. It has been called "the Riddle of Salisbury Plain," for archaeologists have been unable to determine its date of construction or the use to which it

was originally put. It is believed, however, that it was the work of a race of sun-worshippers who lived in Britain as early as 1800 B.C.

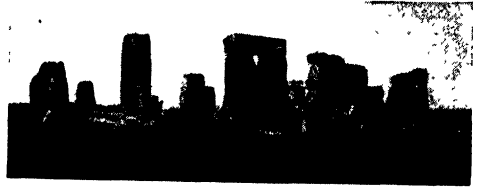


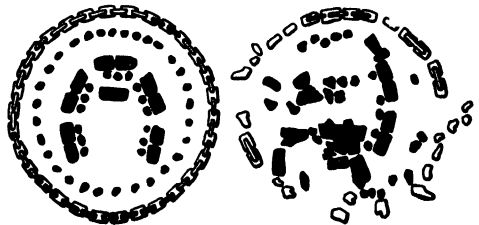
Photo: O R O G

STONEHENGE BEFORE ITS RESTORATION

Later, it is supposed, the Druids (which see) used the structure as a temple.

Originally, the work was probably arranged according to the following plan: The entire monument was surrounded by a circular earthwork, 300 feet in diameter. Within were two concentric circles of standing stones, the outer circle, which consisted of thirty upright and thirty horizontal stones, being 105 feet in diameter. Forty smaller stones made up the inner circle. Within these circles were two other sets of stones, one row within the other and each forming a horseshoe with the opening toward the northeast. Near the central curve of the inner horseshoe, and across a northeast-southwest axis line, was the so-called altar stone, a flat block of blue marble fifteen feet in length. The arrangement of this stone, and of two others placed on a line with it, seems to indicate that they were used to determine the time of the summer solstice. It is on this evidence that authorities base their theory that Stonehenge was connected with the worship of the sun.

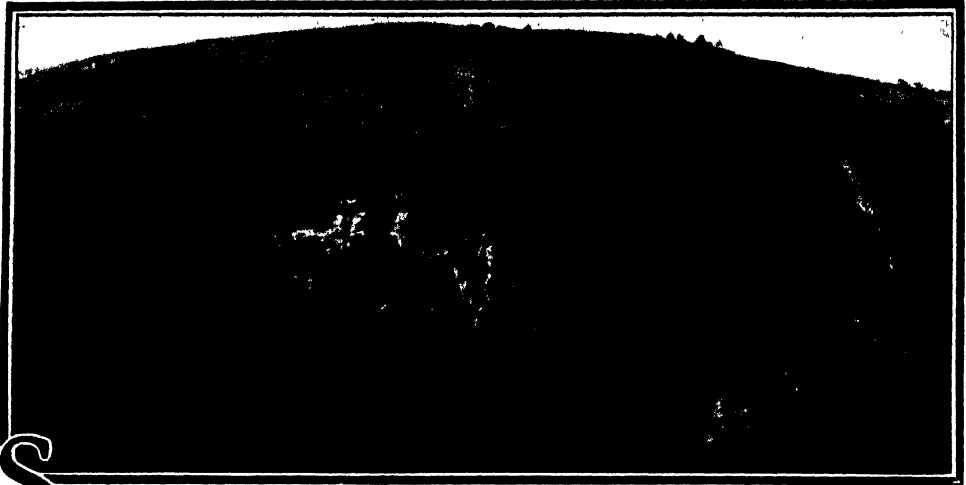
For centuries this great monument was left to fall into ruins, and many of the huge stones were carried away to make bridges and mill-dams. In 1922, however, the British government began the restoration of Stonehenge, replacing missing stones, and to-day the monument stands as a remarkably preserved relic



PLAN OF STONEHENGE

At the left, as the stones originally stood; at right, as they appeared when strewn about by the hand of time.

of an older civilization. It is cared for by the government, and a small fee is charged the public for admittance.



S TONE MOUNTAIN, a huge, rounded mass of light gray, practically unblemished granite, about sixteen miles northeast of Atlanta, Ga. It is 867 feet high at its highest point, and 5,000 feet long. This mound is to be transformed into a permanent memorial of the heroic struggle of the South during the War of Secession, by means of the most colossal piece of sculpturing ever undertaken.

Work on this monument is being carried on under H. Augustus Lukeman, a Southern artist, native of Richmond. In 1925 Lukeman succeeded Gutzon Borglum (both of which see) as sculptor for the gigantic project, and made entirely new designs. These new plans call for a group of equestrian figures, 153 feet in height—as high as a ten-story office building—to be carved out of the solid granite of Stone Mountain. Because of the size of the work, the actual sculpturing cannot be the task of the artist, but is rather a job for drillers. Lukeman's duties, in addi-

tion to supervision, consist of preparing master models. These designs are transferred to Stone Mountain by a series of mathematical measurements which plot the course of every curve, holes being drilled at intervals to trace the

pattern.

Equestrian figures of General Lee, General Jackson, and Jefferson Davis, posed ready to review the marching army, will make up the first group. General Lee's head was partially completed when Lukeman took over the work. An idea of the gigantic size of the figure may be gained from the fact that, at the unveiling of Lee's head, thirty people sat down on the shoulder of the statue. Directly behind the three leaders will be two color-bearers and four other generals, chosen by the historical societies of the South. The



AT WORK ON THE MEMORIAL

Cables hold the artisans in their positions on the side of the mountain. All of the hundreds of figures will be cut in the rock by pneumatic drills.

third group will show the marching army, so designed as to give the illusion of thousands of marching soldiers. Directly beneath the sculpture, at the ground level, will appear thirteen Ionic columns, one for each of the Confederate

States, forming an entrance to the huge Memorial Hall that is to be hollowed out of the rock, and dedicated to the women of the South. The scheme includes also a tomb of an Unknown Soldier, and a museum.

The financial part of the undertaking is in charge of the Stone Mountain Confederate Memorial Association, at the head of which is the honorary president of the United Daughters of the Confederacy. Funds have been collected for the monument, both in the North and in the South. Under the authority of Congress, 5,000,000 coins memorializing the project were minted in 1926. These fifty-cent pieces at first sold for one dollar, but after a few months the price was advanced to two dollars.

STONE OF DESTINY. See CORONATION (Coronation Chair).

STONES, PRECIOUS. See GEMS.

STONEWALL JACKSON. See JACKSON, THOMAS JONATHAN.

STONEWARE. See POTTERY (Varieties).

STORAGE BATTERY. The storage battery can be understood by anyone who will perform the following simple experiment: Connect four dry cells in series. With two wires connect two strips of lead to the terminals of the battery of dry cells. The lead strips should be at least one inch by four inches. Place the lead strips in a solution composed of one part of strong sulphuric acid to twenty parts of water. Bubbles of hydrogen will rise from one of the lead strips, and a red coating will appear on the other. After a few minutes, disconnect the dry cells; then join the lead strips with a wire, and connect them to an electric bell. The bell will ring. A storage

These two plates, one lead, the other lead peroxide, with the sulphuric acid, form a battery which acts like any other electric battery. The acid acts more rapidly on the oxide of lead than it does on the lead. When the two



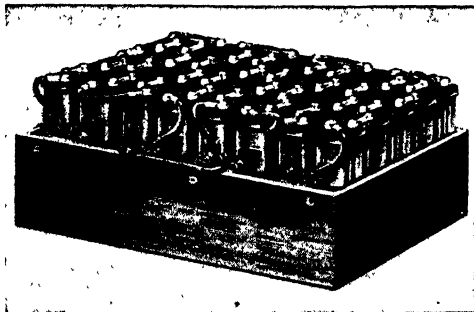
DETAILS OF A STORAGE BATTERY

plates are connected by an electrical conductor this chemical action produces an electric current. It is *chemical energy* which is stored in a storage battery. When the proper electrical connections are made, this chemical energy is transformed into *electrical energy*. When the battery is run down, it is in the same condition as at first; that is, in the simple storage cell described above, the lead peroxide has been reduced to lead, and both plates are again lead. The storage battery may be charged and discharged as often as desired.

The difference between a storage battery and other electric batteries is that, in all other batteries, new solution and new zinc plates must be supplied when the battery is run down, while in the storage battery, the plates and the solution are renewed by passing an electric current through the battery from some other source, and in a reverse direction from that in which the current flows out of the battery.

The plates of commercial storage cells are usually in the form of *grids*. The apertures in the positive plate are filled with lead peroxide, and those of the negative plate with porous lead. When the cell is discharged, both plates consist of monoxide of lead.

In the Edison storage battery, the plates are formed of grids of sheet steel. The grids of the plates which form the positive electrode



HIGH-POTENTIAL STORAGE BATTERY

Small glass containing cells are permanently connected and assembled in hardwood trays.

battery has been formed. (Strictly speaking, a storage *cell* has been formed, but it is now customary to use the term battery for one or several cells.) The current from the dry cells has produced a chemical change on the lead plates, one of the plates becoming coated with an oxide of lead (lead peroxide), the other remaining pure lead.

are filled with nickel hydroxide; the plates forming the negative electrode are filled with an oxide of iron (ferrous oxide) mixed with graphite. The liquid is a solution of caustic potash (potassium hydroxide). The merit of the Edison battery lies in the fact that it will stand, without injury, severe usage which would destroy a lead battery. It has greater capacity in ampere hours in proportion to weight than a lead battery. The voltage of the Edison battery is about 1.1 volts for each cell, while that of a lead battery is two volts.

Storage batteries are used on automobiles driven by gas, for ignition, starting, and lighting, and they are the sole source of power on electrically driven cars. In steam-railway systems, storage batteries are used for lighting; they carry the load while the car is at rest. Batteries of large capacity are used for stand-by service in central power stations, and in power stations for electric railroads, to relieve the generators at the peak of the service. Storage batteries supply the only power available for submarines while they are submerged. These batteries are also employed in connection with radio apparatus, telephone exchanges, fire-alarm systems, and laboratory work, and in private lighting plants not connected with power-station service. H.S.E.

Related Subjects. The reader is referred in these volumes to the following articles:

Edison, Thomas A.
Electric Battery

Electricity
Volt

STORK, a long-legged, strong-winged bird, of large size, finding its food in marshes and

swamps, but often nesting on roofs and chimneys, in close proximity to the dwellings of man. It feeds on eels, frogs and toads, reptiles, young birds, and small mammals. Storks are allied to herons and ibises. The best-known species is the *white stork*, found in summer throughout most of Europe and Central Asia, and migrating for the winter to Africa and Northern India. This stork has pure-white plumage, with black wing coverts

and quills, a red beak, and reddish-pink legs and feet. The pair returns year after year to the same nest, building onto it until it is several feet in height. The three to five eggs are white. The stork has no voice, and can only chatter by striking together the parts of its strong beak.

Other storks of the eastern hemisphere are the *Japanese stork*, the *black stork*, the *white-necked stork*, and the *adjutant*. In South America are found the *maguari stork* and the *jabiru*, a bird five feet high, occurring as far north as Texas.

Much folklore has grown up about the stork, and it is protected and venerated in many sections, especially in Germany and the Netherlands, not only for its usefulness in destroying insects, reptiles, etc., but also as a bird of good omen and the symbol of

domestic affection. From its loving care for its young has come the familiar legend that the stork brings the new baby into the home. See **ADJUTANT; JABIRU.** D.L.

Scientific Name. The stork family is *Ciconiidae*. The white stork is *Ciconia alba*.

STORM LAKE. See **IOWA** (Its Waters).



Photos: Keystone; Visual Education Service

EUROPEAN STORKS

A stork nest on a housetop in Poland is considered an omen of good fortune and prosperity.

STORMS, disturbances of the atmosphere, marked usually by strong winds, rain, snow, or hail, or by a combination of two or more of these. If the temperature of the air were everywhere equal, storms would be unknown. But the sun warms the air unevenly; its heating action is greatest at the equator and is least at the poles. Heated air expands, the upper layers flowing off into the surrounding regions, cooling as they go. This reduces the atmospheric pressure over the warm areas, and increases it elsewhere. Air on the lower levels is thus driven into the center of low pressure, and a rotary circulation on a vast scale is maintained by the action of the sun's heat and the pull of gravitation on the atmospheric envelope.

Storms are known as *general* and *local*. The former alone are described here. Such storms may cover a low-pressure area having a diameter of from 500 to 1,000 miles, but they are not often violent. They are accompanied by shifting winds and more or less rain or snow. Technically, they are known as *cyclones*, or *cyclonic storms*, but they must not be confused with the so-called cyclones of the Mississippi Valley, which are really tornadoes. Storms which occur in areas of high pressure, rather than of low pressure, are given the name *anti-cyclonic storms*.

Cyclonic storms of this nature have well-defined areas on nearly every continent. In North America they cover the great central region between the Rocky and the Appalachian mountains. They have an almost uniform progress from west to east, and it usually requires eight or ten days to complete a cycle; for this reason, storms and fair weather succeed each other at frequent intervals. This regularity of movement makes it possible for the Weather Bureau to foretell, with a good degree of accuracy, the approach of these storms from twenty-four to thirty-six hours in advance.

Thunderstorms are by far the most numerous of all. Not fewer than 45,000 of this variety of storms occur every day over the surface of the earth; this statement is based on observations carried on for years over widely separated areas. The most "thundery" spot in the world is the island of Java, where about 225 storm days occur each year. Central Africa rates next to Java.

The approach of storms in summer is heralded by an area of low pressure. A light southerly wind prevails. The sky becomes hazy or streaked with clouds. The temperature rises; the air becomes uncomfortably humid; local thunderstorms may occur. Whether rain falls or not, the temperature continues to rise until the center of low pressure passes, when the wind shifts to the west or northwest and a welcome coolness ensues, with a drop of ten

or twenty degrees in temperature. The center of the cyclonic area is marked by rain, which results from the rapid condensation of vapor in the cooling clouds. Such are the characteristic phenomena of a summer storm in the Mississippi Valley.

Storms are most frequent in the spring and fall months, and occur oftener in winter than in summer. They attain their maximum violence over the sea, where the wind often blows with such velocity as to be a menace to shipping. Their average duration is about three days, but may be longer.

Though few people enjoy stormy weather, storms are a necessity. Without them we would be deprived of rain or snow and of that variation of temperature so essential to the maintenance of health and the assurance of good crops.

R.H.W.

Related Subjects. More detailed information as to the causes and character of storms will be found in the following articles:

Blizzard	Rain
Cyclone	Snow
Hail	Tornado
Hurricane	Typhoon
Lightning	Weather Bureau
Monsoon	Whirlwind
Norther	Wind

STORMY PETREL. See PETREL.

STORTHING, *stawr' ling*, the legislative body of Norway. See NORWAY (Government).

STORY, EMMA HAYDEN, the real name of Emma Eames (which see).

STORY, JOSEPH (1779-1845), an Associate Justice of the United States Supreme Court. He was born at Marblehead, Mass., was graduated at Harvard in 1798, and three years later began the practice of law. His success was immediate, and he became active in politics, serving in the state legislature and in Congress, where he became known as a leader of the Republican (afterward the Democratic) party. President Madison appointed him an Associate Justice of the Supreme Court in 1811, and he served for thirty-four years, exercising an important influence on American constitutional law. The most celebrated case in which Justice Story wrote the opinion was the Dartmouth College Case, though Chief Justice Marshall handed down the decision. From 1829 until his death, Story was professor of law at Harvard College. See DARTMOUTH COLLEGE, subhead.



Photo: Brown Bros.

JOSEPH STORY



STORY-TELLING. Children have always known that there is nothing in the world more delightful than a good story, well told, but grown people had forgotten the fact for many, many centuries. Time was, in the younger days of the world, when kings and warriors knew no higher pleasure than listening to tales about brave men and beautiful women, but when books became common, the story-tellers lost their hold on their audiences, and gradually the art of story-telling was almost lost. Mothers, to be sure, still told tales to their children in the firelight, but the wider phases were almost unknown.

In very recent years, however, there has been a rebirth of the ancient art. Not only do mothers and teachers make constant use of it, but professional story-tellers delight men and women, as well as children, with this new-old form of entertainment.

The Purposes of Story-Telling. The child, with his incessant demand for stories and "just one more" story, has but one idea in mind—to be amused and entertained. The mother or teacher who makes use of stories for other purposes must therefore bear one fact in mind: unless the story is interesting, the child will not listen; and if he does not listen, the other purposes are defeated at the outset. The first great purpose of story-telling, then, must be to entertain. Nor need this be looked upon as an unworthy aim. The picture, the statue, and the poem exist to give joy, and the story is but another means for appealing to the love for the beautiful.

But story-telling may and does accomplish other things. It may be made, without developing an unpleasantly aggressive moral character, to teach lessons of thoughtfulness, of patriotism, and of faith. In fact, the story furnishes so surely the easiest and most direct road to the child's heart and conscience that one wonders how the mother who cannot or will not tell her children stories ever teaches them any moral lessons.

Then, too, story-telling develops the imagination. There is little danger that, as some parents fear, the child's imagination will be overdeveloped by the use of fairy tales or myths; the danger is far greater that, without these aids, the imagination will be totally undeveloped, and the person will live always in the valleys and never on the mountain tops,

where imagination gives him the right and the ability to live.

From the teacher's point of view, it is of the utmost importance that a love for nature, for history, for many of the works of the great authors, may be awakened by means of stories. This does not mean that the pupils should be given their nature study, their history, or their literature, all in the form of stories; these should be merely the introduction, the appetizer which stimulates a desire for the more solid things.

Other purposes may be mentioned briefly. Powers of concentration are strengthened by listening to stories; the vocabulary is increased and the foundations of an easy, grammatical English style are laid unconsciously. A child's comprehension and sympathies are broadened, too, and he is brought into contact with lives spent amid entirely different surroundings from his own.

How to Choose a Story. Of course, the purpose for which a story is told influences to a certain extent the choice; but there are certain qualities which every story must possess if it is to fulfill any purpose. Older people may listen, through courtesy, to things in which they are not interested, but the child has no conscience in this matter—he listens only to what is so interesting that it holds his attention in spite of himself.

First of all, the story must have action, from beginning to end, and all the action must point to one definite conclusion. Explanations, long descriptions, and "preaching" have no place in a story. Frequently, a practiced story-teller can see in some tale overburdened with these undesirable elements a basis of action which is just what she wants, and can prune away all that retards this action. This one principle cannot be too strongly emphasized—the action need not be particularly exciting, but there must be something happening all the time.

Much depends, too, on the beginning of the story. It must be direct and simple, and must locate the story at once in the child's mind. This does not mean that a definite situation is necessary—the familiar "once upon a time" or "in a wonderful far-off country" answers all requirements, but the hearer must not be left to "flounder." Introductory matter, unless of the very briefest, should be omitted. Unless the

child's attention is held from the very first word, it is difficult to gain later.

No less important is the ending. Stories for grown-ups may present a "section of life," with no solution of the problems raised, no definite rounding-out of the lives of the characters, but children will tolerate no such halfway measures. Everything must be settled, once and for all, before the curtain falls. And the child is perfectly correct, from his own point of view, in demanding a happy ending. He has an innate feeling of justice which tells him that good people should be rewarded and bad people punished, and unless the story works out in that way, there is something wrong with the story. He knows nothing of the complicated ethics of later years, which finds it difficult to separate right from wrong.

One other point is worth remembering. The story must have "points of contact" with the children's experiences; that is, it must present images of familiar objects, though these may be placed amid unfamiliar surroundings or tinged with mystery. The children, for instance, have never seen a princess; but as the story proceeds, it is evident after all that a princess is only a little girl who has to mind her father and mother, just as they have to mind their fathers and mothers. There is enough difference to lend interest, but enough similarity to make comprehension possible.

It is found by story-tellers everywhere that children have a particular fondness for repetition of phrases or sentences within the stories. In the nonsense tale of *Epaminondas and His Auntie*, for instance, Mother's "Epaminondas, you ain't got the sense you was born with" never fails to evoke a delighted grin at every repetition. There seems to be a charm in coming across, in the midst of the newness, a phrase or sentence that has been heard before. Of course, repetition is not really necessary to a successful story, but it is highly desirable.

The story-teller should remember, too, that the vocabulary of the children and their ability to use English are certain to be influenced by the stories to which they listen so absorbedly, and she should choose only such as have a pleasing English style. They need not, in fact should not, be in formal, bookish English, but they should make use of no expressions which the child may not safely adopt.

How to Tell a Story. The story may be told for the most excellent of purposes, and it may possess all the characteristics of the perfect tale, but if it is not well told, it cannot fulfill its whole aim. This should not discourage anyone from attempting to tell stories, however, for, while every one cannot be a natural story-teller with the real "gift," every one may learn to tell a story acceptably. Very much, of course, depends on the personality, but there are certain rules which, if followed, are certain

to bring success. The actual telling is the dynamic, the creative, part of the story-teller's art—the part which can give her real joy, whether she confronts an audience of one or of one hundred.

Know the Story Thoroughly. This might seem an unnecessary warning, but the spectacle is painfully familiar of the story-teller who knows her material only fairly well, and who finds it necessary to repeat, to go back and pick up dropped threads, to make explanations of points that should have been perfectly clear. The story should be so familiar that the teller does not have to think ahead, but can have her mind on each point as she brings it out.

This does not mean that the story should be memorized; indeed, the memorized tale is almost certain to sound more like a recitation than like a genuine "told" story. Nor does it mean that the same words must always be used. Probably there will be changes every time the story is told, but if there are any of those repetitions in which children delight, or conversations or specially favored passages, they should not be changed.

Feel the Story. If the story-teller, after careful study, feels that a certain story is dull or silly, she should not attempt to tell it, no matter how successfully others may have done so. In some way or other, the teller's feeling in regard to the story communicates itself to the hearers, and they will not enjoy to the full a story which the teller is not enjoying.

Be Natural. Many people make a mistake in dealing with children by "talking down" to them or babying them. Children like to feel that the things that interest them are important enough to be dealt with in a grown-up manner, and they resent passively, if not actively, the honeyed voice and the "Now, my dear little children" attitude.

Be Graphic. The story-teller should have vividly before her mind the pictures in the story, and should present these as clearly and directly as possible. Too much thought of the words in which the story is being told works against this graphicness.

Watch the Audience. Anyone who watches her audience, particularly if that audience be composed of children, can tell instantly whether or not she is pressing her points home. If the eyes cling to hers, and every expression of her face is mirrored unconsciously in theirs, she has no need to fear—she is in a fair way to become a successful story-teller.

Will to Succeed. There exists between the teller of the story and the listeners an unexplainable subtle connection which seems almost hypnotic. If the teller thoroughly enjoys a story herself and wills with all her might that her hearers shall enjoy it, she is likely to see a responsive, satisfied look appearing on the faces of the listeners.

Good Stories to Tell

The following stories have all been found to appeal to children. They cover a wide range—the fable, the nature story, the supernatural tale—but they all possess that something which children love. At the close is given a supplementary list of stories.

SPRING STORIES

The Wind and the Sun

One spring day a dispute arose between the Wind and the Sun as to which was the stronger. As they were quarreling, they saw a traveler walking along the road, with a great cloak thrown about his shoulders.

"Now we may make trial of our strength," declared the Wind; "let us both try with all our might, and the one who can compel the traveler to take off his coat shall be acknowledged the more powerful."

"Agreed," said the Sun. "Let the contest begin."

The Wind began by sending a furious blast that nearly snatched the coat away, but the shivering traveler clutched it the more tightly, and drew it about him. The Wind puffed and tugged, and even brought a storm of rain and hail to help him, but the more it stormed, the more closely did the traveler wrap his cloak around him. Finally, the Wind admitted that he could not get it away, and sank down, defeated.

Then the Sun took his turn. He drove away the clouds the Wind had scattered, and shone with all his brightest beams on the man's shoulders. Hotter and hotter it grew until the traveler was really uncomfortable. He unfastened his coat, and then, as the Sun never stopped shining, he threw it back, and finally took it off and ran hastily into the shade. The Sun had won by gentleness what the Wind could not win by force.

The Ugly Duckling

It was glorious in the country; it was summer; the cornfields were yellow, the oats were green, the hay had been put up in stacks in the green meadows, and the Stork went about on his long, red legs, and chattered Egyptian, for this was the language he had learned from his mother. All around the fields and meadows were great woods, and in the midst of these woods, deep lakes. Yes, it was right glorious in the country.

In the midst of the sunshine there lay an old farm, with deep canals about it; and from the wall down to the water grew great burdocks, so high that little children could stand upright under the tallest of them. It was just as wild there as in the deepest wood, and here sat a Duck upon her nest; she had to hatch her Ducklings; but she was almost tired out before the little ones came, and she seldom had visitors. The other ducks liked better to swim about in the canals than to run up to sit under a burdock and gabble with her.

At last one eggshell after another burst open. "Pip! pip!" each cried, and in all the eggs there were little things that stuck out their heads.

"Quack! quack!" said the Duck, and they all came quacking out as fast as they could, looking all around them under the green leaves; and the mother let them look as much as they liked, for green is good for the eye.

"How wide the world is!" said all the young ones; for they certainly had much more room now than when they were inside the eggs.

"D'ye think this is all the world?" said the mother. "That stretches far across the other side of the garden, quite into the parson's field; but I have never been there yet. I hope you are all together," and she stood up. "No, I have not all. The largest egg still lies there. How long is that to last? I am really tired of it." And so she sat down again.

"Well, how goes it?" asked an old Duck who had come to pay her a visit.

"It takes a long time for this one egg," said the Duck who sat there. "It will not open. Now, only look at the others! They are the prettiest little Ducks I ever saw. They are all like their father; the rogue, he never comes to see me."

"Let me see the egg which will not burst," said the old Duck. "You may be sure it is a turkey's egg. I was once cheated in that way, and had much care and trouble with the young ones, for they are afraid of the water. Must I say it to you? I could not make them go in. I quacked, and I clacked, but it was no use. Let me see the egg. Yes, that's a turkey's egg. Let it lie there, and do you teach the other children to swim."

"I think I will sit on it a little longer," said the Duck. "I've sat so long now that I can sit a few days more."

"Just as you please," said the old Duck; and she went away.

At last the great egg burst. "Pip! pip!" said the little one, and crept forth. He was so big and ugly. The Duck looked at him.

"It's a very large Duckling," said she. "None of the others looks like that; it really must be a turkey chick! Well, we shall soon find out. Into the water shall he go, even if I have to push him in."

The next day it was bright, beautiful weather; the sun shone on all the green burdocks. The Mother Duck with all her family went down to the canal. Splash! she jumped into the water. "Quack! quack!" she said, and one duckling after another plumped in. The water closed over their heads, but they came up in an instant, and swam off finely; their legs went of themselves, and they were all in the water; even the ugly gray Duckling swam with them.

"No, it's not a turkey," said she; "look how well he uses his legs, how straight he holds himself. It is my own child! On the whole, he's quite pretty, when one looks at him rightly. Quack! quack! come now with me, and I'll lead you out into the world, and present you in the duck yard; but keep close to me all the time, so that no one may tread on you, and look out for the cats."

And so they came into the duck yard. There was a terrible row going on in there, for two families were fighting about an eel's head, and so the cat got it.

"See, that's the way it goes in the world!" said the Mother Duck, and she whetted her beak, for she, too, wanted the eel's head. "Only use your legs," she said, "so that you can bustle about, and bend your necks before the old Duck yonder. She's the grandest of all here; she's of Spanish blood—that's why she's so fat; and do you see? she has a red rag around her leg; that's something very, very fine, and the greatest mark of honor a Duck can have; it means that one does not want to lose her,

and that she's known by the animals and by men, too. Hurry! hurry!—don't turn in your toes; a well-brought-up Duck turns its toes quite out, just like father and mother—so! Now bend your necks and say 'Quack!' "

And they did so; but the other Ducks round about looked at them, and said quite boldly:

"Look there! now we're to have this crowd, too! as if there were not enough of us already! And—fie!—how that Duckling yonder looks; we won't stand that!" And at once one Duck flew at him and bit him in the neck.

"Let him alone," said the mother; "he is not doing anything to anyone."

"Yes, but he's too large and odd," said the Duck who had bitten him, "and so he must be put down."

"Those are pretty children the mother has," said the old Duck with the rag round her leg. "They're all pretty but that one; that is rather unlucky. I wish she could have that one over again."

"That cannot be done, my lady," said the Mother Duck. "He is not pretty, but he has a really good temper, and swims as well as any of the others; yes, I may even say it, a little better. I think he will grow up pretty; perhaps in time he will grow a little smaller; he lay too long in the egg, and therefore he has not quite the right shape." And she pinched him in the neck, and smoothed his feathers. "Besides, he is a drake," she said, "and so it does not matter much. I think he will be very strong: he makes his way already."

"The other ducklings are graceful enough," said the old Duck. "Make yourself at home; and if you find an eel's head, you may bring it to me."

And now they were at home. But the poor Duckling who had crept last out of the egg, and looked so ugly, was bitten and pushed and made fun of, as much by the ducks as by the chickens.

"He is too big!" they all said. And the turkey cock, who had been born with spurs, and so thought he was an emperor, blew himself up, like a ship in full sail, and bore straight down upon him; then he gobbled and grew quite red in the face. The poor Duckling did not know where he dared stand or walk; he was quite unhappy because he looked ugly, and was the sport of the whole duck yard.

So it went on the first day; and then it grew worse and worse. The poor Duckling was hunted about by every one; even his brothers and sisters were quite angry with him, and said, "If the cat would only catch you, you ugly creature!" And the ducks bit him, and the chickens beat him, and the girl who had to feed the poultry kicked at him with her foot.

Then he ran and flew over the fence, and the little birds in the bushes flew up in fear.

"That is because I am so ugly!" thought the Duckling; and he shut his eyes, but flew on farther; and so he came out into the great moor, where the Wild Ducks lived. Here he lay the whole night long, he was so tired and sad.

Toward morning the Wild Ducks flew up, and looked at their new mate.

"What sort of a one are you?" they asked; and the Duckling turned about to each, and bowed as well as he could. "You are really very ugly!" said the Wild Ducks. "But that is all the same to us, so long as you do not marry into our family."

Poor thing! he certainly did not think of marrying, and only dared ask leave to lie among the reeds and drink some of the swamp water.

There he lay two whole days; then came thither two Wild Geese, or more truly, two Wild Ganders. It was not long since each had crept out of an egg, and that's why they were so saucy.

"Listen, comrade," said one of them. "You're so ugly that I like you. Will you go with us, and become a bird of passage? Near here is another moor, where there are a few sweet, lovely Wild Geese, all unmarried, and all able to say 'Quack!' You've a chance of making your fortune, ugly as you are."



"IF THE CAT WOULD ONLY CATCH YOU!"

"Piff! paff!" sounded through the air; and both the Ganders fell down dead in the reeds, and the water became blood red. "Piff! paff!" it sounded again, and the whole flock of Wild Geese flew up from the reeds. And then there was another report. A great hunt was going on. The gunners lay around in the moor, and some were even sitting up in the branches of the trees, which spread far over the reeds. The blue smoke rose like clouds in among the dark trees, and hung over the water; and the hunting dogs came—splash, splash!—into the mud, and the rushes and reeds bent down on every side. That was a fright for the poor Duckling. He turned his head to put it under his wing; and at that very moment a frightful great dog stood close by the Duckling. His tongue hung far out of his mouth, and his eyes glared horribly. He put his nose close to the Duckling, showed his sharp teeth, and—splash, splash!—on he went without seizing it.

"Oh, Heaven be thanked!" sighed the Duckling. "I am so ugly that even the dog does not like to bite me!"

And so he lay quite quiet, while the shots rattled through the reeds and gun after gun was fired. At last, late in the day, all was still; but the poor little thing did not dare to rise up; he waited several hours still before he looked around, and then hurried away out of the moor as fast as he could. He ran on over

field and meadow; there was a storm, so that he had hard work to get away.

Toward evening the Duckling came to a peasant's poor little hut; it was so tumbled down that it did not itself know on which side it should fall; and that's why it stood up. The storm whistled around the Duckling in such a way that he had to sit down to keep from blowing away; and the wind blew worse and worse. Then he noticed that one of the hinges of the door had given way, and the door hung so slanting that he could slip through the crack into the room; and that is what he did.

Here lived an old woman, with her Cat and her Hen. And the Cat, whom she called Sonnie, could arch his back and purr; he could even give out sparks; but for that, one had to stroke his fur the wrong way. The Hen had quite small, short legs, and therefore she was called Chickabiddy Shortshanks; she laid good eggs, and the woman loved her as her own child.

In the morning they noticed at once the strange Duckling, and the Cat began to purr and the Hen to cluck.

"What's this?" said the woman, and looked all around; but she could not see well, and therefore she thought the Duckling was a fat duck that had strayed. "This is a rare prize!" she said. "Now I shall have duck's eggs. I hope it is not a drake. We must try that."

And so the Duckling was taken on trial for three weeks, but no eggs came. And the Cat was master of the house, and the Hen was the lady, and always said, "We and the world!" for they thought they were half the world, and by far the better half. It seemed to the Duckling that one might have another mind, but the Hen would not allow it.

"Can you lay eggs?"

"No."

"Then will you hold your tongue!"

And the Cat said, "Can you curve your back, and purr, and give out sparks?"

"No."

"Then you will please have no opinion of your own when sensible folks are speaking!"

And the Duckling sat in a corner and was in low spirits; then he began to think of the fresh air and the sunshine; and he was seized with such a strange longing to swim in the water that he could not help telling the Hen of it.

"What are you thinking of?" cried the Hen. "You have nothing to do, that's why you have these fancies. Lay eggs, or purr, and they will pass over."

"But it is so charming to swim in the water," said the Duckling, "so nice to feel it go over one's head, and to dive down to the bottom!"

"Yes, that's a fine thing, truly," said the Hen. "You are clean gone crazy. Ask the Cat about it—he's the cleverest thing I know—ask him if he likes to swim in the water, or to dive down: I won't speak about myself. Ask our mistress herself, the old woman; no one in the world knows more than she. Do you think she wants to swim, and to let the water close above her head?"

"You don't understand me," said the Duckling.

"We don't understand you! Then pray who is to understand you? You surely don't pretend to be cleverer than the Cat and the woman—I won't say anything of myself. Don't make a fool of yourself, child, and thank your Maker for all the good you have. Are you not come into a warm room, and have you not folks about you from whom you can

learn something? But you are a goose, and it is not pleasant to have you about. You may believe me, I speak for your good. I tell you things you won't like, and by that one may always know one's true friends! Only take care that you learn to lay eggs, or to purr and to give out sparks!"

"I think I will go out into the wide world," said the Duckling.

And so the Duckling went away. He swam in the water, and dived, but he was shunned by every creature because he was so ugly.

Now came the fall of the year. The leaves in the wood turned yellow and brown; the wind caught them so that they danced about; and up in the air it was very cold. The clouds hung low, heavy with hail and snowflakes, and on the fence stood the raven, crying, "Croak! croak!" for mere cold; yes, one could freeze fast if one thought about it.

One evening—the sun was just going down in fine style—there came a whole flock of great, handsome birds out of the bushes; they were shining white, with long, supple necks; they were swans. They uttered a very strange cry, spread forth their glorious great wings, and flew away from that cold region to warmer lands, to fair open lakes. They mounted so high, so high! and the ugly Duckling had such a strange feeling as he saw them! He turned round and round in the water like a wheel, stretched out his neck toward them, and uttered a cry, so high, so strange, that he feared as he heard it. Oh! he could not forget those beautiful, happy birds; and as soon as he could see them no longer, he dived down to the very bottom, and when he came up again, he was quite beside himself. He did not know what the birds were, nor where they were flying to; but he loved them more than he had ever loved anyone. He did not envy them at all. How could he think of wishing to have such loveliness as they had? He would have been glad if only the ducks would have let him be among them—the poor, ugly creature!

And the winter grew so cold, so cold! The Duckling had to swim about in the water, to keep it from freezing over; but every night the hole in which he swam about became smaller and smaller. It froze so hard that the icy cover sounded; and the Duckling had to use his legs all the time to keep the hole from freezing tight. At last he became worn out, and lay quite still, and thus froze fast in the ice.

Early in the morning, a peasant came by, and found him there; he took his wooden shoe, broke the ice to pieces, and carried the Duckling home to his wife. Then the Duckling came to himself again. The children wanted to play with him; but he thought they wanted to hurt him, and in his terror he flew up into the milk pan, so that the milk spilled over into the room. The woman screamed and shook her hand in the air, at which the Duckling flew down into the tub where they kept the butter, and then into the meal barrel and out again. How he looked then! The woman screamed, and struck at him with the fire tongs; the children tumbled over one another as they tried to catch the Duckling; and they laughed and they screamed!—well was it that the door stood open, and the poor creature was able to slip out between the bushes into the newly fallen snow. There he lay quite worn out.

But it would be too sad if I were to tell all the misery and need which the Duckling had to bear in the hard winter. He lay out on the moor among the reeds when the sun began to shine again and the larks to sing; it was a beautiful spring.

Then all at once the Duckling could flap his wings: they beat the air more strongly than before, and bore him stoutly away; and before he well knew it, he found himself in a great garden, where the elder trees stood in flower, and bent their long, green branches down to the winding canal, and the lilacs smelt sweet. Oh, here it was beautiful, fresh, and



NO LONGER UGLY AND HATEFUL TO LOOK UPON

springlike! and from the thicket came three glorious white swans; they rustled their wings, and sat lightly on the water. The Duckling knew the splendid creatures, and felt a strange sadness, such as he had never known before.

"I will fly away to them, to the royal birds! and they will beat me, because I, that am so ugly, dare to come near them. But it is all the same. Better to be killed by them than to be chased by ducks, and beaten by fowls, and pushed about by the girl who takes care of the poultry yard, and to suffer hunger in winter!" And he flew out into the water, and swam toward the beautiful swans; these looked at him, and came sailing down upon him with outspread wings. "Kill me!" said the poor creature, and bent his head down upon the water, and waited for death. But what saw he in the clear water? He saw below him his own image; and, lo! it was no longer a clumsy, dark-gray bird, ugly and hateful to look at, but—a swan!

It matters nothing if one is born in a duck yard, if one has only lain in a swan's egg.

He felt quite glad at all the need and hard times he had borne; now he could joy in his good luck, in all the brightness that was round him. And the great swans swam round him and stroked him with their beaks.

Into the garden came little children, who threw bread and corn into the water; and the youngest cried, "There is a new one!" and the other children shouted, "Yes, a new one has come!" And they

clapped their hands and danced about, and ran to their father and mother; and bread and cake were thrown into the water; and they all said, "The new one is the most beautiful of all! so young and so handsome!" and the old swans bowed their heads before him.

Then he felt quite ashamed and hid his head under his wings, for he did not know what to do; he was so happy, and yet not at all proud, for a good heart is never proud. He thought how he had been driven about and mocked and despised; and now he heard them all saying that he was the most beautiful of all beautiful birds. And the lilacs bent their branches straight down into the water before him, and the sun shone warm and mild. Then his wings rustled; he lifted his slender neck and cried from the depths of his heart:

"I never dreamed of so much happiness when I was the Ugly Duckling."

SUMMER STORY

A Little Dutch Hero

Holland is a little country, but the Dutch children love it just as much as you love your great, big country. There are many curious things to be seen there—the wooden shoes and the windmills and the odd little caps and the far-reaching gardens of tulips; but the most curious of all are the dikes which hold back the sea. For Holland is lower than the ocean, and some parts of it would be flooded every time the tide rises, were it not for these great walls which the people have built.

Little Hans knew what a dreadful thing it would be if the sea ever pushed through these walls; and when he walked or played with his little brother along the dikes, he used to tell him stories of how the sea tried and tried and tried to get into Holland, because Holland was so beautiful, and how the brave dikes keep it out.

One day Hans and his little brother had wandered in their playing very far from home—so far that Hans had grown tired, and climbed up on the dike to rest. The little brother was playing with stones at the foot of the dike. Suddenly he called out.

"Oh, Hans, what a funny little hole!"

"A hole," repeated Hans. "Where?"

"Right here," said the brother. "There's water in it."

Hans's heart almost stopped beating as he slid down the dike, and he was still more frightened when he saw the hole. It was a very little hole, to be sure, but the water was oozing through, drop by drop; and Hans knew how quickly the angry sea could tear a great hole, if it were given the tiniest opening. He looked about, but there was no one in sight. And when he looked back at the hole, he could see that it had grown larger, so that now the water was trickling through in a little stream.

Hans thrust his forefinger into the hole, and found that it fitted exactly. Then he turned to his little brother.

"Run," he said; "run home as fast as you can and tell father that the dike is leaking."

The little fellow started off as fast as his short legs would carry him, and Hans was left alone, waiting and waiting. On the other side of the dike, the sea seemed to be muttering to itself as it splash—splash—splashed against the wall.

"I *will* come in—I *will* come in," it seemed to be saying.

Hans thrust his finger in deeper.

"You shall *not* come in—you shall *not* come in," he said aloud.

That was at first, when he was very brave, but later, when little brother could be seen no longer and when his finger began to grow cold and numb, he just kept very still, with his eyes on the road. Then his hand grew numb, and his arm and shoulder, and finally it seemed to him that his whole body was



"YOU SHALL NOT COME IN," HE SAID

frozen. Sharp cramp pains ran up his arm and down his side, and the sea seemed to be laughing at him for setting his little strength against its great power. Once he almost pulled his finger out, but then he thrust it in farther than ever, and leaned his head against the dike.

O, how long it seemed before, far off down the road, he saw a black spot. It was moving—it was coming nearer and nearer; and at last he could see his father and the neighbors, and could hear them shouting, "We're coming! We're coming!"

Very tenderly they drew out Hans's numb finger, and while they mended the dike with their pickaxes and shovels they praised him for his bravery, and told him that he was a real hero. And when the work was done, they marched home like an army, two and two, singing, and Hans rode on his father's shoulders.

And if you lived in Haarlem, you would hear to this day the story of the brave boy who held back the sea.

AUTUMN STORIES

The Coming of the Corn

Adapted from *Hiawatha*.

Hiawatha wanted, more than anything else in the world, the good of his people—that Indian tribe which he loved better than himself. As he wandered in the woods, he saw the squirrel and the wild goose, the strawberry, and the wild grape, and heard the splash of the fish in the river; but

he wanted for his people something different, something better than all these.

And so he built a lodge in the forest, far away from his people, and there for seven days and seven nights he fasted, all the time sending up prayers to the Great Spirit for the good of his people. On the fourth day, as he lay half faint with hunger on his bed of leaves, he looked out between the poles of his wigwam and saw, approaching through the radiance of the sunset, a youth whom he had never seen before.

The young man was tall and straight, and so supple that he swayed in the wind like a sapling. His garments were green and yellow, his hair was long and yellow, and above his forehead green plumes waved. As Hiawatha lay wondering whether this were vision or reality, the youth approached and spoke to him.

"Hiawatha, your prayer has been answered, because it is not a selfish prayer, but asks for the good of your people. I, Mondamin, have been sent to show you how, with labor and struggle, that great good for which you pray may come. Rise and wrestle with me."

Weakly Hiawatha rose, but, with the first touch of the stranger, he felt himself grow stronger, and



WON AS A GIFT FOR HIS PEOPLE

more and more strength came to him as they wrestled, till the sunset light was gone.

"Enough," cried Mondamin. "You have wrestled well, Hiawatha; to-morrow, at the same hour, I shall come again to try my strength with yours."

With the words he was gone, and Hiawatha's strength went with him. But the next day, and

the next, when the sky was reddest with the sunset, Mondamin came again and wrestled with Hiawatha. Just before he vanished on that third day, he said, "To-morrow is the day of your triumph. You will conquer me, and then you must lay me in a shallow grave, where the gentle rain and the warm sun may reach me. But first take from me my green and yellow garments."

And on the fourth day, it happened as he had said. Hiawatha felt his strength coming to him in great waves, and he wrestled with such power that suddenly, before he knew how it had happened, Mondamin lay before him on the grass, dead.

Not quite understanding, but willing to obey, Hiawatha stripped the soiled and torn garments from the young stranger, and laid him under the soft mold. For days he watched beside the grave, keeping the earth soft above it, driving away the ravens, and pulling out the weeds. And at last, one morning, he saw peeping through the soft, black earth a tiny point of green. Soon it was a long, green spear, and before the summer was over, there stood above the grave where Mondamin had been laid the first maize plant, with its waving green plumes and its yellow, silken tresses—the wonderful Indian corn, which Hiawatha had won as a gift for his people.

Androcles and the Lion

A story of gratitude

Long, long ago, in Rome, the great theater was crowded to the very top. The emperor, in his gorgeous purple robe, sat in his box with his attendants about him, and all the people, in their best clothes, sat on the marble seats, fairly holding their breath with excitement. For they were to see the sport that they liked best of all—a very cruel sport, it would seem to us. A runaway slave, who had been recaptured, was to be torn to pieces by a lion, and from the iron cage the roars of the savage beast could be heard from time to time.

Now the slave was led in, trembling. He fell on his knees in the center of the arena, and raised his clasped hands, pleading for mercy, toward the emperor; but the emperor's eyes were cold and hard, and the people shouted, "The lion! Bring in the lion."

Suddenly the great doors of the cage beneath the imperial box swung outward. There was a breathless pause, and then, slowly, as though he knew his prey could not escape him, the lion stepped out onto the sand of the arena. He was a lean and hungry lion, for he had been kept without food that he might be the more savage, and furnish better sport for the spectators. O, how powerful his claws looked, and how the people who were safe on the high seats trembled, as he snarled and showed his white teeth.

A moment he stood there, lashing his sides with his tail and turning his shaggy head from side to side. And then, suddenly, he spied the slave, crouched on the sand, with bowed head. The great cat began to creep slowly toward his prey, switching his tail and narrowing his eyes. The people scarcely breathed; would he never spring? Yes, he was crouching now for his leap! Just then the slave raised his head, and the lion, his powerful muscles already released for the spring, checked himself and fell short. And, marvel of marvels, instead of rushing at the cowering slave with steel claws out, the lion fairly groveled in the sand before him! He rubbed against the man and

fondled him with his paws, while the noise of his mighty purring reached to the farthest part of the great theater.

Then how the people shouted! And the emperor, leaning over the railing of his box, beckoned to the slave to come near. With his hand on the lion's head, the slave approached.

"Are you a worker of magic," queried the emperor, "or how have you tamed the most savage beast of the jungle?"

"Oh, most gracious majesty," replied the slave—for he was a learned slave and knew how to speak to an emperor—"thou knowest that I escaped from



ANDROCLES AND THE LION

a most cruel master and fled to Africa. There I hid in a cave on the edge of the desert, and one day there came into my cave a great lion.

"He whined and held up his paw, and I saw, sticking in it, a long thorn. Because I have always loved animals and cannot bear to see one suffer, I conquered my fear and drew out the thorn, and the beast, after licking my hands, left me.

"Thou knowest, too, most gracious sire, that I was taken and brought back to Rome, and condemned to be torn to pieces by a lion. This lion has a better memory than I have—I did not recognize him, but he knew me, and has spared my life, as thou hast seen."

The slave ceased, and the people, who had heard enough to guess at what had happened, sent up a mighty shout.

"Life and freedom! Life and freedom for the slave!" they cried.

And the emperor, to please himself as well as to please the people, said, "So great a marvel has never been seen in Rome. Both are free—the lion and the slave—and no man may again lay hands on them."

And with his hand still on the lion's head, the freed slave walked out.

The Larks in the Cornfield

Once upon a time, there lived in a great big cornfield a happy Lark family—a mother Lark and her little baby Larks. It was a beautiful, quiet place to live, but the mother Lark had one worry; she knew that, when the corn was ripe and the reapers came, their sharp scythes and their heavy shoes would hurt the little Larks. So she watched and listened very carefully, and when she had to leave the nest to gather food, she told the little Larks to watch and listen very carefully for any sign of the reapers' coming.

One day she came home and found the little Larks almost fluttering out of the nest in their excitement.

"Oh, mother, mother," they cried as soon as they could see her. "Take us away, take us away at once. To-day the farmer was walking with his sons in the cornfield, and he said, 'The corn is ripe and must be cut; let us get our neighbors to help us.' And he told his sons to go at once and ask all the neighbors to come to-morrow and help him reap his corn."

"Is that all?" laughed the mother Lark. "We'll not move to-day, and you needn't be frightened at all; for if he waits for his neighbors to come and do his reaping, we are safe for some time. Listen carefully to-morrow and tell me what he says."

The next evening when she came home, she found the little Larks chattering and chirping with fear.

"Mother, dear mother," they cried all together, "you must surely move us now. To-day the farmer walked again in his cornfield, and we heard him say, 'This corn is *very* ripe; we cannot wait for our neighbors now. Go, my sons, and ask your uncles and your cousins and your grandfathers to come to-morrow and help us cut the corn.' And they went—we saw them go. Oh, mother, surely you will move us to-night."

But the mother Lark only laughed. "No," she said, "we'll not go to-night. We are safe enough yet. The uncles and cousins and grandfathers will be so busy cutting their own corn that they'll not disturb our field for a time. Go to sleep, my babies, but listen carefully to-morrow."

The third evening the mother Lark came home and the little ones said, "To-day when the farmer came to his cornfield he was quite angry and gruff. 'This corn will be ruined; it's getting far too ripe,' he said, 'we'll wait no longer for our neighbors and our relatives—we'll cut the corn ourselves.' And he called his sons and sent them out to hire reapers to come and reap the corn to-morrow. But we weren't frightened, mother, for we know now that he never means what he says."

"Indeed," said the mother Lark, beginning to bustle about, "he means it *this* time. When a man attends to his own business instead of waiting for someone else to do it, the business gets done. Come, children, we are moving out to-night."

WINTER STORIES

The Ant and the Grasshopper

There was once a foolish little grasshopper that spent all her time playing. Through the long summer and autumn, she did nothing but sing from morning till night. So when winter came, and the snow covered the ground, she hadn't a morsel of food stored away in her house.

Soon she was so faint with hunger that she begged her neighbor, the Ant, to give her something to eat.

"I am starving," she said; "give me a grain of wheat."

"Why did you not save some grain at harvest time?" asked the Ant. "There was plenty to be had. What were you doing?"

"I was singing," answered the Grasshopper, "I had no time for work."

"Hoity toity!" cried the Ant; "if you sang all summer, you must dance hungry to bed in winter."

The Fir Tree

Out in the forest stood a pretty little Fir Tree. It had a good place; it could have sunlight, air there was in plenty, and all around grew many larger comrades—pines as well as firs. But the little Fir Tree wished ardently to become greater. It did not care for the warm sun and the fresh air; it took no notice of the peasant children, who went about talking together, when they had come out to look for strawberries and raspberries. The children often came with a whole basketful, or with a string of berries which they had strung on a straw. Then they would sit down by the little Fir Tree and say, "How pretty and small this one is!" The Fir Tree did not like that at all.

Next year he had grown bigger, and the following year he was taller still.

"Oh, if I were only as tall as the others!" sighed the little Fir. "Then I would spread my branches far around and look out from my crown into the wide world. The birds would then build nests in my boughs, and when the wind blew, I would nod grandly."

It took no pleasure in the sunshine, in the birds, or in the red clouds that went sailing over it morning and evening.

When it was winter, and the snow lay all around, white and sparkling, a hare would often come jumping along and spring right over the little Fir Tree. Oh, that made him so angry! But two winters went by, and when the third came, the little Tree had grown so tall that the hare was obliged to run around it.

"Oh, to grow, to grow, and become old; that's the only fine thing in the world," thought the Tree.

In the autumn, the woodcutters always came and felled a few of the largest trees; that was done this year, too, and the little Fir Tree, that was now quite well grown, shuddered with fear, for the stately trees fell to the ground with a crash, and their branches were cut off, so that the trees looked quite naked, long, and slender, and could hardly be recognized. Then they were laid upon wagons, and the horses dragged them away out of the wood. Where were they going? What destiny awaited them?

In the spring, when the Swallows and the Stork came, the Tree asked them, "Do you know where the big firs were taken? Did you meet them?"

The Swallows knew nothing about it, but the Stork looked thoughtful, nodded his head, and said:

"Yes, I think so. I met many new ships when I flew out of Egypt; on the ships were tall masts; I fancy these were the trees. They smelt like fir. I can assure you they're stately—very stately."

"Oh, that I were big enough to go over the sea. What kind of a thing is this sea, and how does it look?"

"It would take long to explain all that," said the Stork, and he went away.

"Rejoice in thy youth," said the Sunbeams; "rejoice in thy fresh growth, and in the young life that is within thee."

And the Wind kissed the Tree, and the Dew wept tears upon it; but the Fir Tree did not understand.

When Christmas time approached, quite young trees were felled, sometimes trees which were neither so old nor so large as this Fir Tree, that never rested but always wanted to go away. These beautiful young trees kept all their branches; they were put upon wagons, and horses dragged them away out of the wood.

"Where are they all going?" asked the Fir Tree. "They are not greater than I—indeed, one of them was much smaller. Why do they keep all their branches? Whither are they taken?"

"We know that! We know that!" chirped the Sparrows. "Yonder in the town we looked in at the windows. We know where the fir trees go. We have looked in at the windows and have seen that they are planted in the middle of a warm room, and dressed up in the greatest splendor with the most beautiful things—gilt apples, honey cakes, playthings, and many hundreds of candles."

"And then?" asked the Fir Tree, trembling through all its branches. "And then? what happens then?"

"Why, we have not seen anything more. But it was wonderful!"

"Perhaps I may be destined to this glorious end one day!" cried the Fir Tree, rejoicing.

"That is even better than traveling across the sea. How I long for it! If it were only Christmas! Now I am great and grown-up, like the rest who were led away last year. Oh, if I were only on the wagon! If I were only in the warm room amidst all the pomp and splendor! And then? Yes, then something even better will come, something far more charming, else why should they adorn me so? There must be something grander, something greater still to come; but what? Oh! I'm suffering, I'm longing! I don't know myself what is the matter with me!"

"Rejoice in us," said Air and Sunshine. "Rejoice in thy fresh youth here in the woodland."

The Fir Tree did not rejoice at all, but it grew and grew; winter and summer it stood there, green, dark green. The people who saw it said, "That's a handsome tree!" and at Christmas time it was felled before any of the others. The ax cut deep into its marrow, and the tree fell to the ground with a sigh; it felt a pain, a sensation of faintness, and could not think at all of happiness, for it was sad at parting from its home, from the place where it had grown up; it knew that it should never again see the dear old companions, the little bushes and the flowers all around, perhaps not even the birds.

The Tree came to itself only when it was unloaded in a yard, with other trees, and heard a man say:

"This one is famous; we want only this one for our Christmas!"

Now two servants came, in gay liveries, and carried the Fir Tree into a large, beautiful room. All around the walls hung pictures, and by the great stove stood large Chinese vases with lions on the covers; there were rocking chairs, silken sofas, great tables covered with picture books, and toys worth a hundred times a hundred dollars; at least, the children said so. And the Fir Tree was put into a great tub filled with sand; but no one could see that it was a tub, for it was hung round with green cloth, and stood on a large, many-colored carpet. Oh, how the Tree trembled! What was to happen now? The servants, and the young

ladies, also, decked it out. On one branch they hung little bags cut out of colored paper, and every bag was filled with sweetmeats. Golden apples and walnuts hung down as if they grew there, and more than a hundred little candles, red, white, and blue, were fastened to the different boughs. Dolls that looked exactly like real people—the Tree had never seen such before—swung among the foliage,



"YONDER IN THE TOWN WE LOOKED IN AT THE WINDOWS"

and high on the summit of the Tree was fixed a tinsel star. It was splendid.

"This evening," said all, "this evening it will shine."

"Oh," thought the Tree, "that it were evening already! Oh, that the lights may be soon lit! When will that be done? I wonder if trees will come out of the forest to look at me? Will the Sparrows fly against the panes? Shall I grow fast here, and stand adorned in summer and winter?"

But the Tree had a backache from mere longing, and the backache is just as bad for a tree as the headache for a person.

At last the candles were lighted. What a brilliance! what a splendor! The Tree trembled so in all its branches that one of the candles set fire to a green twig, and it was scorched, but one of the young ladies hastily put the fire out.

Now the Tree might not even tremble. Oh, that was terrible! It was so afraid of setting fire to some of its ornaments, and it was quite bewildered with all the brilliance. And now the folding doors were thrown open, and a number of children rushed in as if they would have overturned the whole Tree, while the older people followed more deliberately. The little ones stood quite silent, but only for a minute; then they shouted till the room rang; they danced gleefully round the Tree, and one present after another was plucked from it.

"What are 'they' about?" thought the Tree. "What's going to be done?"

And the candles burned down to the twigs, and as they burned down, they were extinguished, and then the children were given permission to plunder the Tree. They rushed in upon it, so that every branch cracked again; if it had not been fastened by the top and by the golden star to the ceiling, the Tree certainly would have fallen down.

The children danced about with their pretty toys. No one looked at the Tree except one old man, who came up and peeped among the branches, but only to see if a fig or an apple had not been forgotten.

"A story! A story!" shouted the children, as they drew a little fat man toward the Tree. He sat down just beneath it—"for then we shall be in the green wood," said he, "and the Tree may have the advantage of listening to my tale. But I can tell only one. Will you hear the story of Ivede-Avede, or of Klumpey-Dumpey, who fell downstairs, and still was raised up to honor and married the princess?"

"Ivede-Avede," cried some; "Klumpey-Dumpey," cried others, and there was a great crying and shouting. Only the Fir Tree was silent, and thought, "Shall I not be in it? Shall I have nothing to do in it?" But he had been in the evening's amusement and had done what was required of him.

And the fat man told about Klumpey-Dumpey, who fell downstairs, and yet was raised to honor and married the princess. And the children clapped their hands, and cried, "Tell another, tell another!" for they wanted to hear about Ivede-Avede; but they got only the story of Klumpey-Dumpey.

The Fir Tree stood quite silent and thoughtful; never had the birds in the wood told such a story as that; Klumpey-Dumpey fell downstairs, and yet came to honor and married the princess at last!

"Yes, so it happens in the world!" thought the Fir Tree, and believed it must be true, because that was such a nice man who told it.

"Well, who can know? Perhaps I shall fall downstairs, too, and marry a princess!" And it looked forward with pleasure to being adorned again, the next evening, with candles and toys, gold and fruit. "To-morrow I shall not tremble," it thought. "I shall rejoice in all my splendor. To-morrow I shall hear the story of Klumpey-Dumpey again, or perhaps that of Ivede-Avede, too."

And the Tree stood all night quiet and thoughtful.

In the morning, the servants and the chamber-maid came in.

"Now my splendor will begin afresh," thought the Tree.

But they dragged him out of the room and upstairs to the garret, and there they put him in a dark corner where no daylight shone.

"What's the meaning of this?" thought the Tree. "What am I to do here? What is to happen?"

And he leaned against the wall, and thought, and thought. And he had time enough, for days and nights went by, and nobody came up; and when at length some one came, it was only to put some great boxes in a corner. Now the Tree stood quite hidden away, and the supposition is that it was quite forgotten.

"Now it's winter outside," thought the Tree. "The earth is hard and covered with snow, and people cannot plant me; therefore, I suppose I'm to be sheltered here until spring comes. How considerate that is! How good people are! If it were

only not so dark here, and so terribly solitary! Not even a little hare! It was pretty out there in the wood, when the snow lay thick and the hare sprang past; yes, even when he jumped over me; but then I did not like it. It is terribly lonely up here!"

"Piepl! Piepl!" said a little Mouse, and crept forward, and then came another little one. They smelt at the Fir Tree, and then slipped among the branches.

"It's horribly cold," said the two little Mice, "or else it would be comfortable here. Don't you think so, old Fir Tree?"

"I'm not old at all," said the Fir Tree. "There are many much older than I."

"Where do you come from?" asked the Mice. "And what do you know?" They were dreadfully inquisitive.

"Tell us about the most beautiful spot on the earth. Have you been there? Have you been in the storeroom, where cheeses lie on the shelves, and hams hang from the ceiling; where one dances on tallow candles, and goes in thin and comes out fat?"

"I don't know that," replied the Tree; "but I know the wood, where the sun shines and the birds sing."

And then it told all about its youth.

And the little Mice had never heard anything of the kind; and they listened, and said:

"What a number of things you have seen! How happy you must have been!"

"I?" replied the Fir Tree; and it thought about what it had told. "Yes, those were really quite happy times." But then he told of the Christmas Eve, when he had been hung with sweetmeats and candles.

"Oh!" said the little Mice, "how happy you have been, you old Fir Tree!"

"I'm not old at all," said the Tree. "I came out of the wood only this winter. I'm only rather backward in my growth."

"What splendid stories you can tell!" said the little Mice.

And next night they came with four other little Mice, to hear what the Tree had to relate: and the more it said, the more clearly did it remember everything, and thought, "Those were quite merry days. But they may come again. Klumpey-Dumpey fell downstairs, and yet he married the princess. Perhaps I may marry a princess, too!" And then the Fir Tree thought of a pretty little Birch Tree that grew out in the forest; for the Fir Tree, that Birch was a real princess.

"Who's Klumpey-Dumpey?" asked the little Mice.

And then the Fir Tree told the whole story. It could remember every single word; and the little Mice were ready to leap to the very top of the tree with pleasure. Next night a great many more Mice came, and on Sunday two Rats even appeared; but these thought the story was not pretty, and the little Mice were sorry for that, for now they also did not like it so much as before.

"Do you know only one story?" asked the Rats.

"Only that one," replied the Tree. "I heard that on the happiest evening of my life; I did not think then how happy I was."

"That's a very miserable story. Don't you know any about bacon and tallow candles—a storeroom story?"

"No," said the Tree.

"Then we'd rather not hear you," said the Rats. And they went back to their own people. The little Mice at last also stayed away; and then the Tree sighed and said, "It was very nice when they sat around me, the merry little Mice, and listened when I spoke to them. Now that's past, too. But I shall remember to be pleased when they take me out."

But when did that happen? Why, it was one morning that people came and rummaged in the garret; the boxes were put away, and the Tree was brought out; they certainly threw him rather roughly on the floor, but a servant dragged him away at once to the stairs, where the daylight shone.

"Now life is beginning again," thought the Tree.

It felt the fresh air and the first sunbeams, and then it was out in the courtyard. Everything passed so quickly that the Tree quite forgot to look at itself, there was so much to look at all around. The courtyard was close to a garden, and there everything was blooming; the roses hung fresh and fragrant over the little paling, the linden trees were in blossom, and the swallows cried, "Quinze-wit! quinze-wit! my husband's come!" But it was not the Fir Tree that they meant.

"Now I shall live!" cried the Tree, rejoicingly, and spread its branches far out; but, alas! they were all withered and yellow, and it lay in the corner among nettles and weeds. The tinsel star was still upon it, and shone in the bright sunshine.

In the courtyard, a couple of the merry children were playing, who had danced round the Tree at Christmas time, and had rejoiced over it. One of the youngest ran up and tore off the golden star.

"Look at what is sticking to the ugly old Fir Tree!" said the child, and he trod on the branches till they cracked under his boots.

And the Tree looked at all the blooming flowers and the splendor of the garden, then looked at itself, and wished it had remained in the dark corner of the garret; it thought of its fresh youth in the wood, of the merry Christmas Eve, and of the little Mice which had listened so pleasantly to the story of Klumpey-Dumpey.

"Past! past!" said the old Tree. "Had I but rejoiced when I could have done so! Past! past!"

And the servant came and chopped the Tree into little pieces; a whole bundle lay there; it blazed brightly under the great boiling copper, and it sighed deeply, and each sigh was like a little shot; and the children, who were at play there, ran up, seated themselves by the fire, looked into it, and cried "Puff! puff!" But at each explosion, which was a deep sigh, the Tree thought of a summer day in the woods, or of a winter night there, when the stars beamed; he thought of Christmas Eve and of Klumpey-Dumpey, the only story he had ever heard or knew how to tell; and thus the Tree was burned.

The boys played in the garden, and the youngest had on his breast a golden star, which the Tree had worn on its happiest evening. Now that was past, and the Tree's life was past, and the story is past, too: past! past!—and that's the way with all stories.

The Little Match Girl

It was on a bitterly cold and snowy New Year's Eve. A little girl was wandering in the dark, cold streets; she was bareheaded and barefooted. She had certainly worn slippers when she left home, but they were not much good, for they were so huge.

They had last been worn by her mother, and they fell off the child's feet when she was running across the street, to avoid some carriages that were rolling by. One of the shoes could not be found at all; and the other was picked up by a boy who ran off with



HER LITTLE HANDS WERE STIFF WITH COLD

it, saying that it would do for a cradle when he had children of his own. So the poor little girl had to go on with her little bare feet, which were red and blue with cold.

She carried a quantity of matches in her apron, and she held a packet of them in her hand. Nobody had bought any of her during all the long day; nobody had given her a penny. The poor little creature was hungry and perishing with cold, and she looked the picture of misery. The snowflakes fell upon her long, yellow hair, which curled so prettily about her face, but she paid no attention to that.

Lights were shining from every window, and there was a most delicious odor of roast goose in the streets, for it was New Year's Eve—she could not forget that. She found a corner where one house projected a little beyond the next one, and here she crouched, drawing up her feet under her, but she was colder than ever. She did not dare go home, for she had not sold any matches, and had not earned a single penny. Her father would beat her; besides, it was almost as cold at home as it was here. They had only the roof over them, and the wind whistled through it, although they stuffed up the biggest

cracks with rags and straw. Her little hands were stiff with cold.

Oh, one little match would do some good! Should she pull one out of the bundle and strike it on the wall to warm her fingers? She pulled one out. *Critch*, how it spluttered, how it blazed! It burned with a bright, clear flame, just like a little candle when she held her hand round it.

It was a very curious candle, too. In its light the little girl fancied she was sitting in front of a big stove with polished brass feet and handles. There was a splendid fire blazing in it and warming her so beautifully, but—what happened?—just as she was stretching out her feet to warm them, the blaze went out, the stove vanished, and she was left sitting with the end of the burned-out match in her hand.

She struck a new one; it burned, blazed up, and where the light fell upon the wall, it became transparent like gauze, and she could see right through it into the room. The table was spread with a snowy cloth and pretty china; a roast goose stuffed with apples and prunes was steaming on it. And, what was even better, the goose hopped from the dish with the carving knife sticking in his back, and it waddled across the floor. It came right up to the poor child, and then—the match went out, and there was nothing left to be seen but the thick, black wall.

Again, she lit another match. This time she was sitting under a lovely Christmas tree. It was much larger and more beautifully decorated than the one she had seen when she peeped through glass doors at the rich merchant's house this very last Christmas. Thousands of lighted candles gleamed upon its branches, and colored pictures such as she had seen in the shop windows looked down upon her. The little girl stretched out her hands to touch them, but—out went the match.

All the Christmas candles rose higher and higher, till she saw that they were only the twinkling stars.

So she struck another match against the wall, and this time it was her grandmother who appeared in the circle of the flame. She saw her quite clearly and distinctly, looking so gentle and happy.

"Grandmother!" cried the little creature, "Oh, do take me with you! I know you will vanish when the match goes out; you will vanish like the warm stove, and the goose, and the Christmas tree."

She hastily struck a whole bundle of matches, because she did so long to keep her grandmother with her. The light of the matches made it as bright as day. Grandmother had never before looked so big, nor so beautiful. She lifted the little match girl up in her arms, and they soared in a circle of light and joy, far, far above the earth, where there was no more cold, no hunger, no pain, for they were with God.

OTHER STORIES

Baucis and Philemon

Long, long ago, in a far-away land called Greece, lived people who were very different in some ways from those who live to-day. About some things they knew more than any people who have lived since their time. They made statues and built temples which were more beautiful than any made in later ages, but about some things they knew very little. They had no correct ideas as to how the earth was made, and they believed that there were many gods, who knew all about everything in the world, and who made things happen just as they pleased.

The gods, they believed, could make themselves look like anything they wanted to—so exactly like that not even the brightest eyes could tell the difference. And the old Greeks used to be very fond of telling their children stories about the times when the gods made themselves look like human beings, and came to visit men and women. Then the people whom they visited did not guess that their guests were not men and women just like themselves, and sometimes this was very unpleasant; for if the gods did not like what people were doing and saying, they punished the offenders. One of the stories which the Greek children liked best you may read here.

One day the king of the gods, the wisest and strongest of them all, whose name was Jupiter, called one of his sons to him and said:

"Come, Mercury, let us go and see how the people in Phrygia are behaving themselves."

Mercury was always very glad to go any place with his father, and, in a little while, he was ready.

"But, my son," said Jupiter, "you cannot wear your wings. Everybody who sees you will guess who you are."

"O father," cried Mercury, "I get so tired without my wings."

"Never mind," replied the father; "you may take your staff, which will help you just as much. Nobody will notice that."

It must have been a very strange staff which could be as much help to a boy as a pair of wings, and so, indeed, it was. For it had two little wings of its own, and it made the person who carried it so light that he could scarcely keep his feet on the ground.

The clothes which Jupiter and Mercury put on for this trip were old and shabby, and so, when they came to the town in Phrygia which they meant to visit, people thought they were just beggars. Now, if they had come riding on fine horses, and wearing gold chains about their necks and diamond rings on their fingers, the people in this wicked town would have given them their softest, whitest beds to sleep in, and would have cooked for them fine dinners, for they were always ready to give good things to people who could just as well have paid for them. But when poor, hungry men came to the town, children were sent out to drive them away, and—for the people were very wicked—fierce dogs were turned loose. And that's the way they treated Jupiter and Mercury. How different it would have been had they known who their visitors were!

Mercury, who was young and proud, and had always been used to having his own way, grew very angry, and cried to his father, "Just let me wave my staff over these wicked children and dogs, and turn them all into stone children and iron dogs." But Jupiter said, "No; let us see just how bad they really can be."

So the two travelers were chased out of the village and up a little hill, almost to the gate of a cottage which stood back from the country road. Now it was evening by the time they reached this place, and the two old people who lived in the cottage had finished their work and eaten their supper, and were sitting on a bench beside their door. It was a very hard bench and a very plain, low door, for old Philemon and his wife Baucis were as poor as Jupiter and Mercury looked in their old clothes. But the old couple were very different from the bad people in the town, and as soon as they saw the two men coming, they hurried to the gate as fast as their old feet would take them, and Philemon cried:

"Come in! Come in! Have those saucy children and those snappy dogs been treating you as they treat every stranger? You'll find no saucy children or snappy dog here."

Jupiter and Mercury, smiling at each other, followed the old people to the cottage door, and sat down on the bench there.

"I'm very sorry," said Baucis, "that there is so little in the house to give you to eat. You can see without my telling you that we are very poor. But what there is, I shall be very glad to give you."

While Philemon talked to the visitors and brought water in a wooden bowl that they might wash, his old wife got supper. And even though she thought the visitors were only beggar men, she was just as careful about the meal as she would have been had she known that they were really gods.

Finally, she called Philemon in and said:

"Everything is ready, but this table is so crooked that I am ashamed to ask them to sit at it. One leg is shorter than the rest."

It was hard for Philemon to get down on his knees, for he was old and stiff; but he knelt and shoved pieces of slate under the short table leg, until that corner was as high as the rest. Then Baucis put the supper on the table and called the guests.

And after all, it was not such a bad supper. There was a stew—not very rich or very strong, it is true, but piping hot and nicely seasoned; and there was cheese and brown bread and honey and milk. To be sure, the pitcher that held the milk and the bowl that held the stew were of the commonest brown ware, while the cups and the plates were of wood. But these things the visitors did not seem to mind at all.

Poor Baucis was very much worried for fear there was not enough milk, for the strangers seemed very thirsty after their walk; and when Mercury asked for the third cup of milk, she said sadly, "I'm sorry, young man, but the milk is all gone. I poured the last of it into your cup."

Mercury winked at his father, and there was even a twinkle in Jupiter's eye, though the old people did not see it.

"Just try and see," said Mercury; "maybe you can squeeze out a drop for me."

To show him that she was right, Baucis seized the pitcher and held it upside down over his cup; when lo and behold! the milk came flowing out in such a stream that it filled the cup and ran over onto the floor. Baucis was so startled that she almost dropped the pitcher. She knew that there was no mistake; the pitcher had been empty and was now full, yet no one had poured in a drop. It did not take her as long to guess what had happened as it would take you or me if such a thing should come to pass in our homes; and as soon as she could speak, she cried:

"O Philemon, these are the gods, for nobody but a god could fill an empty pitcher without even touching it. Get down on your knees, Philemon, for these are in truth the gods!"

This time it did not take Philemon so long to kneel—he never stopped to think of his age and stiffness, but down he dropped beside his wife. They both hid their faces in their hands, for they were frightened half to death—not because they had done anything bad, for they knew they hadn't; but just because it was all so wonderful that it almost took their breath away.

"Do not be afraid, good people," said Jupiter in a deep voice. "It is true that we are gods. I am Jupiter, and this is Mercury. But no one who does good need fear the gods, and to you we shall bring nothing but happiness, because you were kind to us when you knew not who we were. The pitcher of milk shall never be empty, no matter how much you drink; the loaf of bread shall never be eaten up, no matter how much you eat, and there shall always be honey to eat with your bread."

"But, father," put in Mercury, "what about those bad people in the village yonder?"

Spoiled boy that he was, he was thinking much more about the punishment that should come to the bad people whose children had thrown stones at him, and whose dogs had torn his clothes, than he was about any reward for the good people who had fed him.

"Come," said Jupiter, "let us go out and look at the village."

Baucis and Philemon scrambled to their feet and followed their guests out of doors, still too excited to speak. From the hilltop on which their house stood, they looked down toward the village, as they had done every day of their life there. They expected to see the white houses with their dark roofs and the higher roofs of the temples shining in the bright moonlight; but at the sight they saw they could only stand and gasp. There was no village there! The valley in which it had stood was filled to the brim—almost to their very gate, in fact—with a lake; and the moon was shining across the lake, making a silver road.

"Our neighbors!" gasped Baucis and Philemon together. "Are they drowned?"

"All turned into fishes," replied Jupiter, "and that's better than they deserved, heartless wretches that they were. Now look behind you, Baucis and Philemon, and see whether you like that sight any better."

The two old people were beginning to feel that they could not bear many more surprises, but they turned slowly and looked at their house. And right before their eyes they saw the poor little cottage changing to a great palace of white marble, with wide marble steps.

"Come," said Mercury, "let me lead you into your new home."

And the old people followed him up the steps and through the doors, and about the beautiful rooms with their marble floors.

"Here shall you live, good Baucis and Philemon," said Jupiter. "And if there is any one thing that you want very much, just ask me, and I will give it to you."

Baucis and Philemon looked at each other. There was no need for them to talk it over, for they had often amused themselves by trying to think what they would say if they ever had a chance to ask for anything they wanted, and they had always decided on the same thing.

"O kind and wonderful Jupiter," answered Philemon, "all we ask is that we may die at the same time. Don't let one of us live after the other is dead."

"It shall be," replied Jupiter. And then, followed by Mercury, he left them, not taking the road around the lake, but walking right across the water on the silver road which the moon made.

For years Baucis and Philemon lived in their beautiful house, and very happy they were, because they always had enough food to set before hungry

people, and plenty of beds where the tired might rest. And you can imagine that they never grew weary of telling their visitors of the wonderful things the king of the gods had done for them, for they never became forgetful or ungrateful.

One day they were standing at their door, one on each side, talking about the goodness of the gods. They thought that all the wonderful things were over, but as they looked at each other, they saw that another very strange thing was coming to pass. They were turning into trees! Their hair turned to leaves, their arms to great branches, and the bark grew about their bodies.

"Dear Baucis," said Philemon, and "Dear Philemon," said Baucis; and then together they said, "Farewell!"

Just as they said it, the bark closed over their mouths, so that they never spoke again. But they grew before the house for many years, and were still good to travelers; for they threw a broad, cool shade which was very pleasant to rest in on hot days. And those who knew the story of the two beautiful trees used to fancy that the trees enjoyed giving pleasure, and used to imagine that they heard the leaves saying, just as the two kind old people had always said:

"Welcome, stranger! Come in! Come in! Rest and refresh yourself."

The Discontented Stonecutter

Once upon a time there was a man who worked from early morning till late at night, cutting building stones out of the solid rock. His pay was small and hardly enough to keep his wife and children from starving. So the poor stonecutter grew discontented, and sighed and moaned bitterly over his hard lot.

One day, when his work seemed harder than usual and his troubles more than he could bear, he cried out in despair:

"Oh, I wish I could be rich and lie at ease on a soft couch with a curtain of red silk!"

Just then a beautiful fairy floated down from heaven, and softly said, "Thy wish is granted thee." So the poor stonecutter found himself rich and powerful, and resting easily on his silken couch with its red curtain. As he gazed out, however, he saw the king of the country ride by with many horsemen before and behind him, and with a great golden sunshade held over his head. It irritated the rich man to have no parasol over his head and to see another more powerful than himself, and in his discontentment he exclaimed, "Would that I were a king such as that one."

Once again his good fairy appeared, waved his wand, and said, "It shall be as thou desirest." Immediately, the man was king, and before him and behind him rode his men-at-arms, and over his head was a golden sunshade. But elsewhere the sun shone fiercely down and dried up the vegetation with its terrible heat. It was reflected into the face of the king, so that even the golden sunshade did not keep him from suffering. Once more he sighed discontentedly, "If I could only be the sun!"

Almost before he spoke, he found himself to be the sun, and he began joyously to send his fiery rays above, below, and everywhere round about him. He scorched the grass of the earth, and burned the faces of its rulers, and felt his power unlimited, until a little cloud placed itself between him and the earth and threw back his scorching rays. It still angered

him to find something more powerful than himself, and he wished aloud that he might be a cloud.

Again his wish was granted, and he found himself floating where he wished, through the sky. He ran between the sun and the earth, and sheltered the latter so that the grass grew green, the trees leaved out again, and everything rejoiced in a new growth. Then he sent great floods of rain upon the earth, filled the rivers till they overflowed, swept homes and herds into the sea, and destroyed the works of man in every direction. But try as he would, he could not move one great rock that stood right across his way. Though he sent waters that roared around its base and pushed hard against it, yet it remained immovable. Such a failure angered the man-cloud, and again he cried out, "Would that I were a rock, so strong and immovable is it."

This time, also, his guardian angel interfered, and he found himself a rock that withstood the sun, the wind, and the waters. But then, one day, there came along a rude stonecutter, who with chisel and heavy hammer began to cut the great rock into small, regular building stones. "What does this mean?" cried the rock. "Has this man power to cut me in pieces? Surely I am weaker than he! Would I were a stonecutter!"

"As thou wishest, so shall it be," said his guardian angel, and immediately he was again a stonecutter, working hard as before and for small wages, but happy and contented with his lot.

The Constant Tin Soldier

There were once five-and-twenty tin soldiers; they were all brothers, for they had all been born of one old tin spoon. They shouldered their tin muskets and looked straight before them; their uniform was red and blue, and very splendid. The first thing they had heard in the world, when the lid was taken off the box, had been the words "Tin soldiers!" These words were uttered by a little boy clapping his hands. The soldiers had been given to him, for it was his birthday; and now he put them upon the table. Each soldier was exactly like the rest; but one of them had been cast last of all, and there had not been enough tin to finish him, but he stood as firmly upon his one leg as the others on their two; and it was just this soldier who became remarkable.

On the table on which they had been placed stood many other playthings, but the toy that attracted most attention was a neat castle of cardboard. Through the little windows one could see straight into the hall. Before the castle some little trees were placed round a little looking glass, which was to represent a clear lake. Waxen swans swam on this lake and were mirrored in it. This was all very pretty; but the prettiest of all was a little Lady who stood at the open door of the castle; she was also cut out of paper, but she had a dress of the clearest gauze, and a little narrow blue ribbon over her shoulders that looked like a scarf; and in the middle of this ribbon was a shining tinsel rose as big as her whole face. The little Lady stretched out both her arms, for she was a dancer, and then she lifted one leg so high that the Tin Soldier could not see it at all and thought that, like himself, she had but one leg.

"That would be the wife for me," thought he; "but she is very grand. She lives in a castle, and I have only a box, and there are five-and-twenty of us in that. It is no place for her. But I must try to make acquaintance with her."

And then he lay down at full length behind a snuffbox which was on the table; there he could easily watch the dainty little Lady, who continued to stand on one leg without losing her balance.

When the evening came, all the other tin soldiers were put into their box, and the people in the house went to bed. Now the toys began to play at "visiting" and at "war," and "giving balls." The tin soldiers rattled in their box, for they wanted to join, but could not lift the lid. The Nut-cracker threw somersaults, and the Pencil amused itself on the table; there was so much noise that the Canary woke up and began to speak, too, and even in verse. The only two who did not stir from their places were the Tin Soldier and the Dancing Lady; she stood straight up on the point of one of her toes and stretched out both her arms; and he was just as enduring on his one leg; and he never turned his eyes away from her.

Now the clock struck twelve—and, bounce!—the lid flew off the snuffbox; but there was not snuff in it, but a little black Goblin; you see, it was a trick.

"Tin Soldier," said the Goblin, "don't stare at things that don't concern you."

But the Tin Soldier pretended not to hear him.

"Just you wait till to-morrow!" said the Goblin.

But when the morning came, and the children got up, the Tin Soldier was placed in the window; and whether it was the Goblin or the draught that did it, all at once the window flew open, and the Soldier fell head over heels out of the third story. That was a terrible passage! He put his leg straight up and struck with his helmet downward, and his bayonet between the paving stones.

The servant maid and the little boy came down directly to look for him, but, though they almost trod upon him, they could not see him. If the Soldier had cried out, "Here I am!" they would have found him; but he did not think it fitting to call out loudly, because he was in uniform.

Now it began to rain; the drops soon fell thicker, and at last it came down in a complete stream. When the rain was past, two street boys came by.

"Just look!" said one of them "There lies a tin soldier. He must come out and ride in the boat."

And they made a boat out of a newspaper and put the Tin Soldier in the middle of it; and so he sailed down the gutter, and the two boys ran beside him and clapped their hands. Goodness preserve us! how the waves rose in that gutter and how fast the stream ran! But then it had been a heavy rain. The paper boat rocked up and down, and sometimes turned round so rapidly that the Tin Soldier trembled; but he remained firm and never changed countenance, and looked straight before him and shouldered his musket.

All at once the boat went into a long drain, and it became as dark as if he had been in his box.

"Where am I going now?" he thought. "Yes, yes; that's the Goblin's fault. Ah! if the little Lady only sat here with me in the boat, it might be twice as dark for what I should care."

Suddenly there came a great Water Rat, which lived under the drain.

"Have you a passport?" said the Rat. "Give me your passport."

But the Tin Soldier kept silence and only held his musket tighter than ever.

The boat went on, but the Rat came after it. Hul! how he gnashed his teeth and called out to the bits of straw and wood—

"Hold him! hold him! He hasn't paid toll; he hasn't shown his passport!"

But the stream became stronger and stronger. The Tin Soldier could see the bright daylight where the arch ended; but he heard a roaring noise, which might well frighten a bolder man. Only think—just where the tunnel ended the drain ran into a great canal; and for him that would have been as dangerous as for us to be carried down a great waterfall.

Now he was already so near it that he could not stop. The boat was carried out, the poor Tin Soldier stiffening himself as much as he could, and no one could say that he moved an eyelid. The boat whirled round three or four times, and was full of water to the very edge; it must sink. The Tin Soldier stood up to his neck in water, and the boat sank deeper and deeper, and the paper was loosened more and more; and now the water closed over the Soldier's head. Then he thought of the pretty little Dancer, and how he should never see her again; and it sounded in the Soldier's ears:

Farewell, farewell, thou warrior brave;
Die shalt thou this day.

And now the paper parted and the Tin Soldier fell out; but at that moment he was snapped up by a great fish.

Oh, how dark it was in that fish's body! It was darker yet than in the drain tunnel; and then it was very narrow, too. But the Tin Soldier remained unmoved and lay at full length, shouldering his musket.

The fish swam to and fro; he made the most wonderful movements and then became quite still. At last something flashed through him like lightning. The daylight shone quite clear, and a voice said aloud, "The Tin Soldier!" The fish had been caught, carried to market, bought, and taken into the kitchen, where the cook cut him open with a large knife. She seized the Soldier round the body with both her hands and carried him into the room, where all were anxious to see the remarkable man who had traveled about in the inside of a fish; but the Tin Soldier was not at all proud. They placed him on the table, and there—no! What curious things may happen in the world! The Tin Soldier was in the very room in which he had been before! He saw the same children, and the same toys stood upon the table; and there was the pretty castle with the graceful little Dancer. She was still balancing herself on one leg, and held the other extended in the air. She was faithful, too. That moved the Tin Soldier; he was very near weeping tin tears, but that would not have been proper. He looked at her, but they said nothing to each other.

Then one of the little boys took the Tin Soldier and flung him into the stove. He had no reason for doing this. It must have been the fault of the Goblin in the snuffbox.

The Tin Soldier stood there quite illuminated, and felt a heat that was terrible, but whether this heat proceeded from the real fire or from love, he did not know. The colors had quite gone off from him; but whether that had happened on the journey or had been caused by grief, no one could say. He looked at the little Lady, she looked at him, and he felt that he was melting; but he stood firm, shouldering his musket. Then suddenly the door flew open, and the draught of air caught the Dancer, and she flew like a sylph just into the stove to the Tin Soldier, and flashed up in a flame and then was gone! Then

the Tin Soldier melted down into a lump, and when the servant maid took the ashes out next day, she found him in the shape of a little tin heart. But of the Dancer nothing remained but the tinsel rose, and that was burned as black as a coal.

Five Out of One Shell

There were five peas in one shell; they were green, and the pod was green, and so they thought all the world was green; and that was just as it should be! The shell grew, and the peas grew; they accommodated themselves to circumstances, sitting all in a row. The sun shone without and warmed the husk, and the rain made it clear and transparent; it was mild and agreeable in the bright day and in the dark night, just as it should be, and the peas as they sat there became bigger and bigger, and more and more thoughtful, for something they must do.

"Are we to sit here everlastingly?" asked one. "I'm afraid we shall become hard by long sitting. It seems to me there must be something outside; I have a kind of inkling of it."

And the weeks went by. The peas became yellow, and the pod also.

"All the world's turning yellow," said they; and they had a right to say it.

Suddenly they felt a tug at the shell. The shell was torn off, passed through human hands, and glided down into the pocket of a jacket in company with other full pods.

"Now we shall soon be opened!" they said; and that is just what they were waiting for.

"I should like to know who of us will get farthest!" said the smallest of the five. "Yes, now it will soon show itself."

"What is to be will be," said the biggest.

"Crack!" the pod burst, and all the five peas rolled out into the bright sunshine. There they lay in a child's hand. A little boy was clutching them, and said they were fine peas for his peashooter; and he put one in directly and shot it out.

"Now I'm flying out into the wide world. Catch me if you can!" And he was gone.

"I," said the second, "I shall fly straight into the sun. That's a shell worth looking at, and one that exactly suits me." And away he went.

"We'll go to sleep wherever we arrive," said the next two, "but we shall roll on all the same." And they certainly rolled and tumbled down on the ground before they got into the peashooter; but they were put in, for all that. "We shall go farthest," said they.

"What is to happen will happen," said the last, as he was shot forth out of the peashooter; and he flew up against the old board under the garret window just into a crack which was filled up with moss and soft mold; and the moss closed round him; there he lay a prisoner indeed, but not forgotten by provident Nature.

"What is to happen will happen," said he.

Within, in the little garret, lived a poor woman who went out in the day to clean stoves, chop wood small, and to do other hard work of the same kind, for she was strong, and industrious, too. But she always remained poor; and at home in the garret lay her half-grown only daughter, who was very delicate and weak; for a whole year she had kept her bed, and it seemed as if she could neither live nor die.

"She is going to her little sister," the woman said. "I had only the two children, and it was not an easy thing to provide for both, but the good God provided for one of them by taking her home for Himself; now

I should be glad to keep the other that was left me; but I suppose they are not to remain separated, and my sick girl will go to her sister in Heaven."

But the sick girl remained where she was. She lay quiet and patient all day long, while her mother went to earn money out of doors. It was spring; and early in the morning, just as the mother was about to go to work, the sun shone mildly and pleasantly through the little window and threw its rays across the floor, and the sick girl fixed her eyes on the lowest pane in the window.

"What may that green thing be that looks in at the window? It is moving in the wind."

And the mother stepped to the window and half opened it. "Oh!" said she, "on my word, that is a little pea which has taken root here and is putting out its little leaves. How can it have got here into the crack? That is a little garden with which you can amuse yourself."

And the sick girl's bed was moved nearer to the window, so that she could always see the growing pea; and the mother went forth to her work.

"Mother, I think I shall get well," said the sick child, in the evening. "The sun shone in upon me to-day delightfully warm. The little pea is prospering famously, and I shall prosper, too, and get up and go out into the warm sunshine."

"God grant it!" said the mother, but she did not believe it would be; but she took care to prop with a little stick the green plant which had given her daughter the pleasant thoughts of life, so that it might not be broken by the wind; she tied a piece of string to the windowsill and to the upper part of the frame, so that the pea might have something round which it could twine when it shot up; and it did shoot up indeed—one could see how it grew every day.

"Really, here is a flower coming!" said the woman one day; and now she began to cherish the hope that her sick daughter would recover. She remembered that lately the child had spoken much more cheerfully than before, that in the last few days she had risen up in bed of her own accord, and had sat upright, looking with delighted eyes at the little garden in which only one plant grew. A week afterward, the invalid for the first time sat up for a whole hour. Quite happy, she sat there in the warm sunshine; the window was opened, and outside before it stood a pink peablossom fully blown. The sick girl bent down and gently kissed the delicate leaves. This day was like a festival.

"The Heavenly Father Himself has planted that pea and caused it to prosper, to be a joy to you and to me also, my blessed child!" said the glad mother; and she smiled at the flower as if it had been a good angel.

But about the other peas? Why, the one who flew out into the wide world and said, "Catch me if you can," fell into the gutter on the roof and found a home in a pigeon's crop; the two lazy ones got just as far, for they, too, were eaten up by pigeons, and thus, at any rate, they were of some real use; but the fourth, who wanted to go up into the sun, fell into the sink and lay there in the dirty water for weeks and weeks, and swelled prodigiously.

"How beautifully fat I'm growing!" said the Pea. "I shall burst at last; and I don't think any pea can do more than that. I'm the most remarkable of all the five that were in the shell."

And the Sink said he was right.

But the young girl at the garret window stood there with gleaming eyes, with the roseate hue of

health on her cheeks, and folded her thin hands over the peablossom, and thanked Heaven for it.

"I," said the Sink, "stand up for my own pea."

Belling the Cat

Long ago the Mice all came together to talk over what they could do to keep themselves safe from the Cat. They sat around in a great circle under an old wash tub, with a candle for light, and wiggled their whiskers, and blinked their eyes, and looked very wise indeed. Some said, "Let us do this," and others said, "Let us do that"; but at last a young Mouse got up, proudly swished his tail, and looked about as though to say he knew more than all the rest of them put together.

"I have thought of something," said he, "that will be sure to keep us safe from the Cat."

"Tell us what it is, then," squeaked the other Mice.

"You all know," said the young Mouse "it is because Pussy creeps up on us so very quietly, that she is right upon us before we see her. If we could only plan something which would let us know when she is coming, then we should always have plenty of time to scamper out of her way. Now I say, let us get a small bell and tie it by a ribbon around her neck. Then she will not be able to move at all without jingling the bell. So when we hear the bell tinkle, we shall always know that she is about, and can easily keep out of her reach."

As the young Mouse sat down, very proud of himself, all the others clapped their paws and squeaked: "Just the thing! Just the thing! Big-Whiskers has told us what we should do!"

They even began talking about whether they should get a silver bell or a brass one, and whether they should use a blue ribbon or a pink one. But at last an old Mouse got slowly up from his seat and said:

"It is all very well what Big-Whiskers has said. What he has thought of would truly be wise, but WHO IS GOING TO PUT THE BELL ON THE CAT?"

The Mice looked at one another; nobody spoke a word. Who indeed would dare go straight up to Pussy and tie the bell about her neck? The old Mouse looked straight at Big-Whiskers, but Big-Whiskers was proud no more. He made himself as small as he could, for he had never, never thought to do such a thing himself. Then the old Mouse said:

"It is all very well to TALK about doing great things, but all that really counts is to DO them."

The City Mouse and the Country Mouse

Two little Mice, who had lived together and played very happily when they were children, became separated as they grew up. One of them moved into a fine house in the city, while the other remained near her old home in the country.

They never quite forgot each other, and one day the City Mouse rambled out into the country and called on her old friend. Naturally, the Country Mouse was delighted at the visit, and she gathered the best of everything she could find for a luncheon.

There were some fine peas, choice bacon, and a little piece of rare old Stilton cheese, all of which seemed very sweet and toothsome to the affectionate hostess when she called the other heartily to come and take part in the good cheer.

From living so long among the rich delicacies of the city, the traveled Mouse had lost her early ap-

petite, and though she nibbled daintily here and there, hoping to please her old friend, yet she never ceased to wonder in her heart how the Country Mouse could take any pleasure in such coarse and ordinary fare.

After dinner, when they sat down to chat over old times, the City Mouse could hold her tongue no longer.

"Really, my dear old friend, I don't see how you possibly can keep so cheerful in such a dismal, dead-and-alive kind of place as this in which you live! Why, I couldn't possibly live here a week! There is no kind of life; there's no society; there's nothing gay or jolly anywhere to be found.

"You go on from one year's end to another, every day just like the one before it, and just like the one that follows it. What you want to do is to come back to the city with me. Come to-night and see what a gay and happy life I lead."

The airs and address of the City Mouse had made the Country Mouse a little discontented, so as soon as it came dark, the two started off for the city, where they quickly found the home of the City Mouse, in which, as it happened, a splendid supper had been given, and from which the guests had barely departed for home.

It was no trouble at all for the City Mouse to gather up the whole heap of dainties, which she placed on one corner of the handsome red Turkey carpet. The plain little Country Mouse was dazzled by so much splendor; she had never seen such a table as was now before her. There was not half of the meats that she could tell the names of, and not knowing what they were or how they tasted, she sat there wondering where to begin.

Suddenly a door behind them creaked and opened, and the servant came in with a light. The two Mice ran hastily into a corner and hid themselves behind a hassock till everything was quiet again, when they returned to their meal.

The first mouthful had not been swallowed when the door opened suddenly again, and in dashed a boy—the son of the master of the house—a noisy, rollicking boy, followed by a fierce little Terrier, that ran straight to the spot where the two friends had just been sitting.

Such a thing was really no great surprise to the City Mouse, who had learned to run to her hole very quickly on the slightest alarm. She did not realize, however, that the Country Mouse knew nothing about this, and so had not told her where to go. The only place the latter could find was back of a big sofa, and there she waited in awful fear while the Terrier barked and tore around the room, enraged at the scent of the Mice.

After a while, however, the boy skipped out again, the Terrier followed, and the room became quiet. The City Mouse was out in an instant and ran quickly to the dainties, which still lay undisturbed on the floor, for the dog had eaten his supper before he came in.

"Come, come," said the City Mouse, "come out; the table is all spread, and everything is getting cold! We shan't be disturbed again, or if we are we can run and hide. Come, now; let's eat and be happy!"

"No, no, not for me!" said the Country Mouse. "I shall be off as fast as I can. There is too much excitement in this life for me. I'd rather have a crust out there in the country, with peace and quietness, than all the fine things you have here in the midst of such frights and terrors as I've had in the last hour."

What are you? Are you a city mouse or a country mouse? Do you live in the country, where you can see the beautiful blue sky with the white clouds sailing through it, where you can play on the rich green grass, and smell the sweet flowers all about you? Or do you live in the dusty, smoky city, with big buildings all around you, where the trees are stunted and the leaves look brown and withered? When you go to school in the morning, do you walk along a neat path on the roadside, among fields rich with growing grain, where you can breathe the pure air and romp in the sunshine? Or do you go to school along hot and dusty pavements, where every time you cross a street you must look sharp and run hard, or be caught by an automobile or a street car?

Sometimes the human mice who live in the country when they are children move into the great city and grow old there. They learn to live in the excitement and to like it, but occasionally, when they sit at home in the evening, they wish they were in the country once more, where the evening breezes would bring them the scent of the apple blossoms, and where at daybreak the birds would waken them from their quiet, peaceful slumber.

Why the Bear Has a Stumpy Tail

One winter's day the Bear met the Fox, who came slinking along with a string of fish he had stolen.

"Hi, stop a minute! Where did you get those from?" demanded the Bear.

"Oh, my Lord Bruin, I've been out fishing and caught them," said the Fox.

So the Bear had a mind to learn to fish, too, and bade the Fox tell him how he was to set about it.

"Oh, it is quite easy," answered the Fox, "and soon learned. You've only got to go upon the ice, and cut a hole and stick your tail down through it, and hold it there as long as you can. You're not to mind if it smarts a little; that's when the fish bite. The longer you hold it there, the more fish you'll get; and then all at once out with it, with a cross pull sideways and a strong pull, too."

Well, the Bear did as the Fox said, and though he felt very cold and his tail smarted very much, he kept it a long, long time down in the hole, till at last it was frozen in, though, of course, he did not know that. Then he pulled it out with a strong pull, and it snapped short off, and that's why Bruin goes about with a stumpy tail to this day!

Supplementary List. *SPRING STORIES.* *What Was Her Name?* (Richards' *Five Minute Stories*); *Little Ida's Flowers* (Andersen); *Legend of the Arbutus*.

SUMMER STORIES. *Rheocus* (adapted from Lowell's poem); *King of the Golden River* (Ruskin); the story of Joan of Arc; *Horatius at the Bridge*.

AUTUMN STORIES. The story of Ruth (from the Bible); *The First Thanksgiving*; the story of Arachne.

WINTER STORIES. Parts of Dickens' *Christmas Carol*; *The Happy Prince* (Oscar Wilde); the Christmas story (from the Bible); *The Birds' Christmas Carol* (Riggs).

Related Subjects. The following articles in these volumes will be helpful in connection with this article on story-telling:

Aladdin
Ali Baba
Alice's Adventures in
Wonderland (under
Dodgson, Charles L.)

Arabian Nights
Bible (The Bible for
Children)

Cinderella
Drama (Shakespearean
Drama in Schools)
Evangeline
Fable
Fairies
Fiction
Games and Plays
Hiawatha
Language
Legend

Literature (Literature
for Children; Books
for Children)
Mother Goose
Mythology
Novel
Rhymes of Childhood
Rip Van Winkle
Robinson Crusoe
Santa Claus

STOSS, *shlohs*, VEIT (about 1440-1533), a famous sculptor and one of the greatest masters of wood carving Germany has ever produced. Many of the statements made about his life are a matter of doubt, but it is believed that he was born and educated at Nuremberg; it is known that he practiced his great art alternately in that city and in Cracow, Poland. Most of his creations are religious in character, and they show a depth of spiritual understanding rare among artists of his time. Stoss's works may be seen in cathedrals and public buildings in various parts of Germany.

Representative Works. Among the most notable of his wood carvings are the high altar in the Church of Saint Mary's, Cracow, and *The Angel's Salutation*, in the Nuremberg Church of Saint Lawrence. His sculptured stone figures include the red marble *Monument of King Casimir IV* and three reliefs entitled *Last Supper*, *Christ on the Mount of Olives*, and *Taking of Christ*. The Nuremberg Germanic Museum possesses his famous relief *Coronation of the Blessed Virgin*, and several other examples of his art.

STOUT. See BEER (Kinds).

STOUT INSTITUTE. See WISCONSIN (Education).

STOVE, an apparatus in which fuel is used to generate heat for cooking, for heating water, or for warming a room. The use for which it is intended, and the kind of fuel burned, determine the material, design, and construction of a stove. Iron, cast or sheet, is the most common material in America; in Europe, tile and brick are used, and the stove is built into the house. Gas and electric stoves have many of their parts enameled. The essential features of a stove for heating are an enclosure in which a fire may be built; iron bars, or a grate arrangement, near the bottom, on which the fire rests; provision for admitting air for combustion, through openings below the firepot; and a pipe to carry the smoke to the chimney. Wood was the most common fuel when the first stoves were made, but constant attention was needed to keep the fire burning, and the heat was not even. Coal proved much more satisfactory, and the base-burner stove, which is filled with coal from the top and arranged to feed only a limited amount of fuel at a time, overcame many of the difficulties of the wood stove. Natural gas is a very desirable fuel when it may be obtained cheaply; kerosene, oil, gas, and electricity are used for heating,

and specially designed stoves have been made for these fuels.

The fuel for cook stoves, often called ranges, includes gas, electricity, kerosene, gasoline, coal, and wood. Coal and wood stoves are used when gas or electricity are not available, and, because the former radiate so much heat into the room, kerosene or gasoline stoves are substituted during the warmer weather. The coal or wood is burned in a fire box; dampers are used to control the air currents through the stove and chimney; and the ashes fall into a drawer-like box. Warming ovens are often built on each side of the stovepipe, about eighteen inches above the cooking surface, and a hot-water reservoir, built to one side or the back, is an added convenience.

Gas and electric stoves are made with three or four burners, on which the cooking vessels may be placed in direct contact with the flame or electric coil, and an oven is placed to one side or below. Improved designs in these stoves have made them efficient and easy to care for and manage; with such a stove, it is possible for the modern housekeeper to prepare an elaborate meal before the fire in a coal or wood stove could get hot enough for cooking.

Stoves were used for heating in Alsace some years before America was discovered, and in 1742 Benjamin Franklin invented his Pennsylvania fireplace, or Franklin stove, which was a marked improvement over the open fireplace. Cooking stoves came later, and in 1798 the first one used in the United States was invented.

Related Subjects. The reader is referred in these volumes to the following articles:

Electric Heating	Gas
Fireless Cooker	Heating and Ventilation

STOWE, HARRIET ELIZABETH BEECHER (1811-1896), an American novelist, remembered

chiefly as the author of *Uncle Tom's Cabin*. She was the sister of Henry Ward Beecher, and was born and educated at Litchfield, Conn. Her family moved first to Boston and then to Cincinnati, where her father was made president of the newly established Lane Theological Seminary; and in 1836 Harriet was married to Professor Calvin E. Stowe, of that institution.

The Ohio River was the dividing line between free and slave soil, and she must have seen many slaves escaping to freedom, perhaps at times even aiding in their escape. She visited homes in Kentucky, also, where she witnessed some of the scenes described in *Uncle Tom's Cabin*. In 1850 Professor Stowe and his wife moved to Brunswick, Me., and later to Andover, Mass. After her husband's death, in 1886, Mrs. Stowe lived in Hartford, Conn.

Estimate of Her Work. Mrs. Stowe, because of her famous novel published in 1852, is one of the small number of writers whose productions are so completely a part of the political development of the United States

as to make it difficult to judge their work as literature. Her masterpiece was written from an impulse to show the Northern states the real nature of slavery, and, naturally, it is strongly partisan. It does not fail, however, to reveal the pleasant side of slave life. Since it was written under pressure, in order to keep up with its publication as a serial, it has the faults which belong to all hasty work, but it is, nevertheless, a great book, because of its vivid narrative and excellent character drawing. That it is remarkably dramatic in its nature is shown by its continued popularity as a play. *Uncle Tom's Cabin* was translated into at least twenty-three languages, and it is not too much to say that it has had not only a wider sale than any other work by an American novelist, but was farther reaching in its effects than any other piece of fiction ever written.

Of Mrs. Stowe's other works, the best are *The Minister's Wooing* and *Oldtown Folks*, really charming sketches of New England life. *Dred* is a novel of



AN EARLY FORM OF STOVE

slave life which never became very popular, and *A Dog's Mission* and *Little Pussy Willow* are stories for children.

STRABISMUS, *strah biz' mus*. See SQUINT.

STRABO, *stra' bo* (about 64 B.C.—about A.D. 21), a celebrated Greek geographer and historian. He was born at Amasia, in Pontus, removed to Rome when he was about thirty-five years of age, and made that city his home for many years. He traveled extensively, however, in Arabia and through Southern Europe and Northern Africa. It was on these journeys, supplemented by the works of earlier writers on geography, that his great *Geography* was based. The seventeen books of this work are extant, the first two dealing with physical geography, the next eight with Europe, six with Asia, and one with Africa. This is the most important work on geography that has come down from ancient times; in it is seen an attempt to gather together all the attainable knowledge of the science.

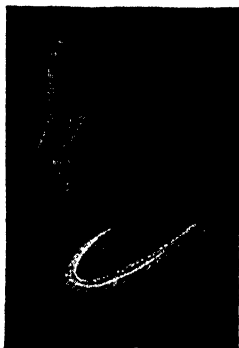


Photo: U. A. U.

HARRIET BEECHER STOWE
As she appeared at the
time of her marriage.

STRACHEY, *stra' kih*, GILES LYTON (1880-), an English writer, notable for contributing a distinctive type of biography to modern English literature. He was born in London, the son of Lieutenant General Sir Richard Strachey, a distinguished administrator in India. He was educated at Trinity College, Cambridge, and in his student days showed a decided aptitude for writing. Copies of the undergraduate magazines of his day contain poems of his that far surpass the usual student productions.

Strachey's first book, *Landmarks in French Literature*, appeared in 1912. It was admirably written, and showed a taste for the classics. His real fame, however, began in 1918 with the publication of his *Eminent Victorians*. This book was considered revolutionary, because the author's attitude toward his subjects was impartial rather than partisan—he placed no whitewash on the heroic figures of the Victorian Era. Yet, in spite of this spirit of realism, there was no detraction for its own sake. The boundaries of good taste were never transgressed.

The success of the book was immediate; it set a new standard in biographical writing, and revealed high qualities of wit and learning on the part of the author. The outstanding features of the new biography are that it is essentially dramatic in design, and is written

in the form of the novel, rather than that of history. Dull and ordinary facts are omitted, and significant incidents are emphasized. The characters are treated as human beings, rather than as puppets or lay figures. As a whole, the treatment is both realistic and imaginative. Historical facts are used as a basis, but they are organized according to a well-designed dramatic pattern.

Strachey's succeeding books have continued to enhance his reputation, and have marked him as a writer of scholarly achievements, discriminating taste, and brilliant style.

His Other Writings. In addition to the two works mentioned above, Strachey has published *Queen Victoria*, *Books and Characters*, *Pope*, and *Elizabeth and Essex*.

STRADIVARIUS, *strad ih va' rih us*, OR **STRADIVARI**, *strah de vah' re*, ANTONIO (1644-1737), one of the greatest violin-makers of all time. He was born at Cremona, Italy, and early entered the employ of Nicola Amati, a celebrated Cremonese master of violin-making. Not until 1600 did he free himself from the traditions of the Amati school and begin to exhibit a style of his own. From 1700 to 1715, his instruments reached the height of perfection, not only in brilliance of tone and power, but in the excellence of form and wonderful precision with which the minutest detail was executed. He seldom afterward deviated from his standard pattern. The Stradivarii of his later period were made merely under his direction, and they therefore never again reached the standard of perfection of the master's own products, which brought fabulous prices.

At the time of his death, many unfinished instruments were found in his workshop. These were completed by either his sons or his pupils, but bore his name on the printed labels. Unsuspecting purchasers have been deceived into buying instruments having the outward appearance of his violins, but there are very few genuine specimens in existence. See VIOLIN.

STRAFFORD, *straf' urd*, THOMAS WENTWORTH, first Earl of (1593-1641), an English statesman, the signing of whose death warrant was one of the greatest blots on the character of Charles I. He was born in London, of an ancient family, and in 1614, 1621, 1624, and 1628, was elected to Parliament.

In the second Parliament of which he was a member, Wentworth stood strongly for the rights of that body, and this spirit of resistance to the aggressions of the king characterized him also in the first Parliament of Charles I. He did not, however, sympathize with the Puritans nor share their intense hostility toward the Crown. In 1627 he was imprisoned for a short time for refusing to pay ship money, a tax the king levied upon persons and communities for the national defense, and in 1628 he advocated the Petition of Right.

Feeling that he could not follow Parliament further in its demands, he accepted from the king, on December 25, 1628, the presidency of the Council of the North; six months before, he had been created Baron Wentworth, and on December 10, Viscount Wentworth. In his dealing with affairs in the north, he showed himself very eager to restore order, and gradually he identified himself more and more thoroughly with the king and became less and less sympathetic toward Parliament. In 1633 he went as lord deputy to Ireland, where, because of his coercion, he came to be cordially hated. However, he usually showed good judgment in a most difficult position.

Returning to England in 1639, he was created Earl of Strafford, and was consulted by the king on all important questions. The Presbyterians of Scotland had become troublesome, and Strafford advised the king to make use of Irish troops against them, and to assert his royal prerogative in every possible way. When the Long Parliament met, in November, 1640, it at once determined to impeach Strafford for his administration of Ireland, and the king summoned him to London, promising that he should not suffer "in life, honour, or fortune." Parliament dropped the impeachment, for which there was insufficient evidence, and in May, 1641, passed a bill of attainder, action being hurried by the discovery of a plot of the king's to rescue Strafford by force. The unfortunate statesman released Charles from his promise, and the king signed the bill on May 10. Two days later, Strafford was executed.

Related Subjects. The events with which Strafford was connected led to the COMMONWEALTH OF ENGLAND (which see). Consult, also, the references there noted.

STRAIGHT UNIVERSITY. See LOUISIANA (Education).

STRAIN, in surgery. See SPRAIN.

STRAIT OF GIBRALTAR. See GIBRALTAR, subhead.

STRAIT OF MAGELLAN. See MAGELLAN, subhead.

STRAIT OF MALACCA, *mah lak' ah*. See MALACCA, subhead.

STRAIT OF MESSINA, *mes e' nah*. See MESSINA, STRAIT OF.

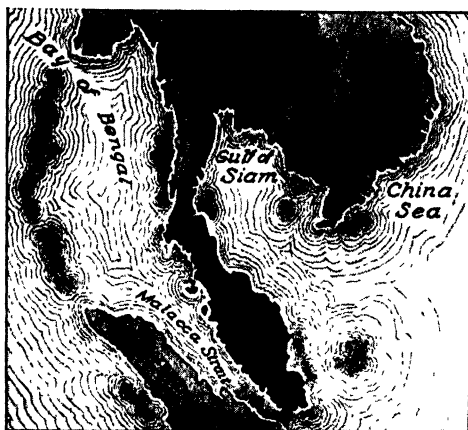
STRAITS OF FLORIDA. See MEXICO, GULF OF.

STRAITS SETTLEMENTS, a British crown colony on and adjacent to the southwestern part of the Malay Peninsula, including the settlements of Singapore, Penang, and Malacca. They are so called from the straits (Malacca) that separate the peninsula from Sumatra. The colony has a total area of about 1,600 square miles and a population estimated at 1,059,968 in 1927. There are about 11,300 whites; the Asiatic inhabitants are chiefly Chinese, Malays, and natives of India. Christmas Island was added to the Straits Settle-

ments in 1880, and in 1900 was placed under the administrative jurisdiction of Singapore; it is important for its phosphate deposits.

Singapore is an island less than a mile from the southern extremity of the peninsula.

Penang settlement consists of the island of Penang, sometimes called Prince of Wales Island, off the west coast of the peninsula;



THE STRAITS SETTLEMENTS
(In black.)

a strip of land opposite the mainland (Province Wellesley); and the Dindings, consisting of the small island of Pangkor, off the west coast, and a corresponding strip of mainland territory. Penang is largely a jungle, but fertile and productive where it has been cleared.

Malacca is situated on the western coast of the peninsula between Penang and Singapore. [Singapore and Malacca are described in these volumes under their respective titles.]

Singapore, on the island of that name, and Georgetown, on Penang, are the chief ports, and from them are shipped vast quantities of tin, spices, rubber, gum, rattan, sugar, coffee, and other tropical products. Singapore is the capital of the Straits Settlements. The colony has been under the administration of the British Colonial Office since 1867. Education is provided for the natives, and school attendance is compulsory. There are two colleges in the colony: Raffles College, with courses in liberal arts; and the King Edward VII College of Medicine.

STRAMONIUM, *strah mo' nih um*, a poisonous, ill-smelling weed of the nightshade family, whose seeds and leaves have medicinal value. Other names for it are *Jimson weed*, *devil's trumpet*, *stinkweed*, and *thorn apple*. It abounds in fields and waste spots, the forked yellow-green stems often reaching a height of five feet. It bears heavily scented, white, trumpet-shaped flowers, and large, smooth, green, sharp-pointed leaves, from three to eight inches long. Prickly, burlike pods contain tiny,

wrinkled, black seeds, which, like the leaves, are used in making the drug called stramonium. This drug is similar to belladonna (which see) in properties, and is used principally for the relief of asthma. The plant is widely distributed throughout the warmer parts of the world. Children should be cautioned not to put its poisonous seeds, leaves, or flowers into their mouths. See POISONOUS PLANTS. B.M.D.

Scientific Name. Stramonium belongs to the family *Solanaceae*. Its botanical name is *Datura stramonium*.

STRANGLES. See DISTEMPER.

STRANGULATION, in medical practice. See HERNIA.

STRASS. See GEMS (Imitation and Artificial).

STRASSBURG, *stras' boorK*, OR **STRASBOURG,** *strahs boor'*. See FRANCE (Interesting Cities).

STRASSBURG CLOCK. See CLOCK, sub-head.

STRATFORD-ON-AVON, a small town in England (population, about 9,300 in 1921), which is visited by tourists from all over the world. As the birthplace of England's greatest poet—William Shakespeare—Stratford commands an interest out of all proportion to its size and importance. It is situated in the lovely valley of the River Avon, eight miles southwest of Warwick. The greater portion of the town lies on the west bank of the river, and the place is typically English, with pleasant streets, shade trees, and old-fashioned houses.

The house in which the poet was born (see illustration in the article SHAKESPEARE) is preserved as a memorial and is open to visitors. Another interesting spot is the chancel of Holy Trinity Church, containing the graves of Shakespeare and his wife, Anne Hathaway. On the slab above the poet's grave, the pilgrim may still read the curious rhymed epitaph beginning—

Good frend, for Iesus sake forbear
To digg the dust enclosed here.

A Shakespeare Memorial was built on the river bank above the church, and included a theater, a museum, and a library containing valuable books and manuscripts relating to the poet. In 1926 the theater, which had been built in 1879, was burned, though the museum and library were saved. Those interested immediately raised funds to rebuild the theater on a near-by site; the new building seats a thousand people. Annual performances of Shakespearean plays, called summer festivals, have become famous at Stratford. Originally, they lasted only a week, but increased popularity caused the season to be lengthened to ten weeks, and here Shakespearean scholars from all parts of the world gather to see their favorite plays. American tourists, over seven

thousand of whom visit Stratford every year, contributed funds for the erection of a memorial fountain and a clock tower.

At Shottery, a mile west of Stratford, is the quaint thatched cottage where Anne Hathaway lived, while the cottage of Mary Arden, mother of the poet, may be seen at Wilmcote.

Stratford is one of the oldest places in England, dating, probably, from the Roman era.

Related Subjects. The reader is referred to the article SHAKESPEARE for illustrations of the house in which the dramatist was born, for a drawing of the epitaph referred to above, and for illustrations of the Shakespeare theater and the Anne Hathaway cottage.

STRATHCONA AND MOUNT ROYAL, DONALD ALEXANDER SMITH, first Baron (1820-1914), a Canadian fur trader, railway-builder, financier, and statesman, whose career is so closely interwoven with Canadian history that he defies classification and stands forth unique among Canadians of all time. His youth and middle life were devoted to the service of the Hudson's Bay Company and the up-building of the Northwest. He was fifty years old when he held his first political office. At sixty he became the chief promoter of the Canadian Pacific Railway, and for nearly a decade devoted himself to the task of financing this great organization. At seventy-six, an age when the average man's race is run, he accepted the office of Canadian High Commissioner to Great Britain, and for nearly a decade more served his country with energy and ability.

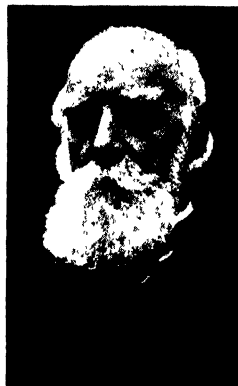


Photo: Brown Bros.

LORD STRATHCONA

With the Hudson's Bay Company. Donald Smith was born at Forbes, Morayshire, Scotland, but in 1838 left Scotland for Canada as a junior clerk in the service of the Hudson's Bay Company. For thirteen years he was stationed in Labrador. Leaving Labrador in 1851, he spent the next decade in the Northwest, where he became, in turn, chief trader and chief factor. Ultimately, he became chief commissioner of the company's fur trade. He was elected to the board of directors in 1883, and to the governorship of the company in 1889.

In Politics. In 1870, on the organization of Manitoba as a province, Smith was elected to the Manitoba assembly as a Conservative, and in the next year was appointed commissioner for the Northwest Territories, and was elected for Selkirk (Man.) to the House of Commons. He resigned his seat in the as-

sembly in 1874, as a result of the prohibition of dual representation, but remained in Parliament until 1880. He again sat in the House of Commons as member for Montreal West (he had in the meantime moved from Winnipeg to Montreal), from 1887 to 1896.

The "C. P. R." The interval between these two periods of service in the Dominion Parliament Smith devoted to the Canadian Pacific Railway, which owed its successful completion no less to his vision of the future and his ability as a financier than to the executive capacity of Sir George Stephen and the assistance of Sir John A. Macdonald. Stephen (later to be Baron Mount Stephen) and Smith already had experience with railways, for, together with James J. Hill, they acquired control of a bankrupt road in Minnesota, out of which has grown the Great Northern Railway. When the time came to award the contract for the construction of a transcontinental railway, Smith's name did not appear in the list of members of the syndicate, because of a recent political quarrel between him and Sir John Macdonald. But it was not long before Smith was recognized as one of the chief factors in the company. For his share in the work, Smith was rewarded with the decoration of Knight Commander of the Order of Saint Michael and Saint George, and became Sir Donald Smith.

High Commissioner in London. During his second term of service in the House of Commons, from 1887 to 1896, Sir Donald was a conspicuous member, although he seldom addressed the House. Near the end of the period, when the Conservative party was falling to pieces, there were suggestions that he should assume the leadership of the party, but he declined the honor, and soon was sent to London as High Commissioner. He was raised to the peerage in 1897, as Baron Strathcona and Mount Royal. See CANADA (History).

STRATIFICATION. See BED (in geology); GEOLOGY.

STRATIFIED ROCKS. Sandstone, shale, and sometimes limestone are formed in layers. These layers are called *strata*, and rocks formed in layers are *stratified rocks*. Stratified rocks have been formed of sediments which were first mud and then became hardened into rock. As originally formed, the layers were practically horizontal, but, by folding of the earth's crust, they have, in many places, been thrown out of their former position, and are now in many different positions, from horizontal to vertical. The angle of inclination which these layers form with a horizontal plane is called the *dip*. See DIP; SEDIMENTARY ROCKS. A.J.

STRATUM, *stra' tum*. See BED (geology).

STRATUS, *stra' tus*, a kind of cloud (which see).

STRAUS, *strous*, OSCAR SOLOMON (1850-1926), an American public official who was identified with the diplomatic service, the world-peace movement, and the arbitration of labor disputes. He was born in Otterberg, in Rhenish Bavaria, Germany, and was the brother of Isidor (a *Titanic* steamship victim) and Nathan Straus, both well known for their interest in humanity. Oscar Straus was brought to America when he was four years old. He was graduated at Columbia University and Columbia Law School, and later engaged in the department-store business in New York. From 1887 to 1889, and from 1897 to 1900, he represented the United States in Turkey.

In 1902 Straus succeeded Benjamin Harrison as a member of the Permanent Court of Arbitration at The Hague, and was reappointed by Presidents Roosevelt, Taft, and Wilson. President Roosevelt appointed him Secretary of Commerce and Labor in 1906, and in 1909-1910 he returned to Turkey as ambassador. An ardent supporter of progressive principles, he joined the Progressive party in 1912, and made an unsuccessful campaign for the governorship of New York. In 1914 he was chairman of the arbitration commission that settled a wage dispute between the heads of the Eastern railroads and their engineers, and the following year became chairman of the New York State Public Service Commission (first district).

In Literature. Straus was the author of several books, including *The Origin of the Republican Form of Government in the United States*, *Reform in the Consular Service*, *The Development of Religious Liberty in the United States*, and *The American Spirit*.

STRAUS, SIMON W. See THRIFT.

STRAUSS, JOHANN (1825-1899), an Austrian composer, whose beautiful dance compositions won him the title of "waltz king." He was born at Vienna. His father, Johann Strauss, was a well-known composer, the first to elevate dance music, especially the waltz, to an artistic plane, but he was bitterly opposed to the ambition of his son for a musical career. The boy's mother, however, paid for his instruction on the violin. When he was nineteen years of age, he left home to conduct a restaurant orchestra at Hietzing, Austria. There he began to present his own compositions, mainly waltzes, and the restaurant soon became crowded with admiring listeners. In 1849, after his father's death, he united his



Photo: Brown Bros.

OSCAR S. STRAUS

own orchestra with that of his father, and began a series of tours of Europe. Everywhere he appeared he received great praise for the grace and beauty of his original dance music. In 1855 he became conductor of summer concerts in Saint Petersburg (now Leningrad), and from 1863 to 1870 was conductor of the Russian Court balls. His last days were spent in Vienna.

Representative Works.

Of Strauss's dance compositions, numbering several hundred, the most noted include *Beautiful Blue Danube*, *Artist's Life*, *One Thousand and One Nights*, and *Wine, Women, and Song*. He composed also several successful operettas, among them *Indigo*, *A Night in Venice*, and *Prince Melchusalem*.



Photo: Brown Bros.

JOHANN STRAUSS

STRAUSS, RICHARD (1864-), a German composer, the outstanding exponent of the so-called school of realism in music. He was born in Munich. His father, Franz Strauss, was one of the greatest horn-players of Germany, and at an early age the son showed marvelous musical ability. He was a good pianist at the age of four, a composer of music worthy of publication at six, and an advanced student of musical theory and composition at ten. Before he was sixteen years old, his songs were becoming well known, and his *Symphony in D Minor* was being played by several eminent pianists. Even Bülow, who was a merciless critic, praised his work and had his *Serenade* performed at Meiningen, Germany. In his early manhood, Strauss gained further notice by his numerous compositions for voice and piano, but he had not yet found his true sphere, for he was merely following the tenets of the classical composers.



Photo: U & U

RICHARD STRAUSS

In 1885 Strauss succeeded Bülow as conductor of the Meiningen orchestra, and at this time came under the influence of the composer Alexander Ritter. The latter induced him to take up the composition of program music, in

which the thought is realistically expressed by the score. Resigning his conductorship, he went to Italy for study and travel, and between 1887 and 1904 produced the great work of his second period, the compositions on which his fame chiefly rests. These include the tone poems *Don Juan*, *Macbeth*, *Till Eulenspiegel*, and *Don Quixote*; the *Domestic Symphony*; and the operas *Guntram* and *Feuersnot*. Storm after storm of criticism, ridicule, and abuse followed the appearance of these works, for, apparently, the composer broke with the time-honored traditions of music. His theory that music should express realistically the thought of the composition carried him to extremes in some of his later works, but he deserves credit for enlarging the scope of musical forms and for his mastery of orchestration. Throughout his career, Strauss showed himself a master of lyric music; his songs rank with the best.

His chief compositions after 1904 were operatic works. These include the brilliant but somewhat repellent *Salome* and *Elektra*; *Der Rosenkavalier*, noted for its beautiful orchestral score; and *Intermezzo* (1924), which critics have praised for its originality. Strauss made a tour of the United States in 1921, conducting several first-class orchestras, and using his own compositions.

STRAW, which consists of the dried stems of oats, wheat, rye, barley, and other grains, has a wide range of usefulness. As a coarse feed for livestock, as bedding for animals, and as a material in manure for fertilizing, straw is used in large quantities on farms where there is enough stock to utilize it. In some cases, the remainders from the grain harvest are burned, but this procedure is considered wasteful by all agricultural authorities. Straw has been utilized by some chemical companies in the production of carbon, phenol oil, pitch, and acetic acid, these being extracted by special processes. Straw is also used in the manufacture of hats, baskets, saddles, bottle covers, paper, suitcases, and strawboard for mounting and binding.

Wheat straw is the most desirable for hat-making. The stems are pulled up, as mowing would injure them. When cut into proper lengths, they are bleached in the sun, stripped of the outer layer, bleached again with sulphur, and sorted with regard to size and color. Even though looms have been invented for straw-weaving, much of the work is still done by hand, particularly in parts of Europe, Japan, and China. Especially fine work in straw-plaiting is done in Tuscany, Italy, where leg-horn braids are made from a special kind of straw. Straw-plaiting as a handicraft has practically ceased in the United States. Panama hats are not made of straw, but from the leaf fiber of a species of palm.

B.M.D.

STRAWBERRY, a luscious red fruit, grown on a plant which is one of the most popular members of the rose family. The plant is a trailing vine whose leaves are borne in clusters of three. One can easily understand why Macaulay exclaimed, on his return from India, that he would gladly trade all the fruits of the Orient for a single basket of strawberries. Dr. Samuel Johnson is credited with the following: "Doubtless the Creator might have made a better fruit than the strawberry—and doubtless also he did not." Just as its relative, the rose, queens it over the rest of the flow-



THE STRAWBERRY

"Doubtless God could have made a better berry, but doubtless God never did" is a sentiment ascribed both to Bishop Whipple and Dr. Boteler, an English physician, as well as Dr. Johnson. The exact phraseology varies.

ers, so the strawberry lords it over the other berries. The domain over which it reigns in America, where it is more extensively cultivated than any other small fruit, stretches from Mexico to Alaska, from New England to the Pacific coast. It is at home in every province of Canada, in Europe, and in South America; and wherever it grows, it is a favorite on account of its delicious flavor, delicate aroma, and rich beauty.

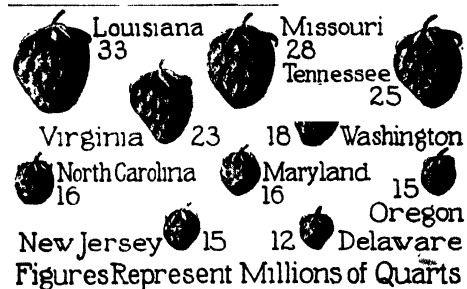
As a matter of fact, the strawberry is not a berry in the technical sense, for it lacks the outer skin, enclosing seeds and pulp, that distinguishes true berries, like currants and huckleberries. It is a fleshy, swollen seed receptacle bearing the dry, yellow seeds upon its pitted outer surface; the star-shaped hull that is re-

moved before the berry is eaten was, early in the season, the calyx of the blossom. Not every blossom will produce fruit, for some lack stamens and need to be grown in the neighborhood of staminate plants, so that their seeds may be fertilized by the pollen. See **Cross-POLLINATION**.

Cultivation. It is the youngest plants that give the best quality and quantity of fruit, and some growers permit their vines to bear but once or twice. Young plants should always be used in "setting" a bed. Both spring and fall planting are practiced, but if the climate is severe, fall planting necessitates a great deal of attention in the way of covering the bed. Very large and fine fruits are obtained by planting in hills and cutting off the runners, but usually strawberries are set in rows and the runners allowed to mat. In the row the plants are from fifteen to eighteen inches apart, while the rows themselves have three or four feet between them, to allow room for cultivation.

Any good garden soil is suitable for strawberry-growing, but the richer the soil the larger the crop, and fertilization is usually necessary after the first heavy bearing. Rotation of crops is generally practiced by commercial growers. One authority gives this advice:

The strawberry is a cold-blooded plant, and is never at its best in a very warm place. A northern slope is more favorable, other things being equal, than a southern one. Land that has been grass within a year or two is to be avoided, on account of the probable presence of white grubs in it. So, also,



THE STRAWBERRIES OF A YEAR

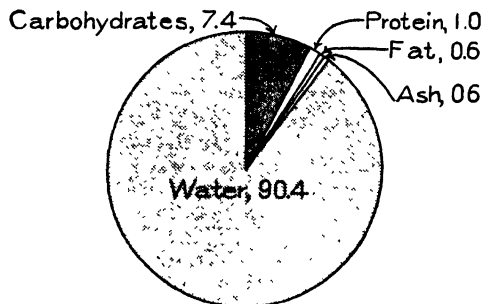
The figures represent the yield in average years in the leading American states.

land that has been in strawberries within a year is liable to contain insect enemies or rust spores. The best results cannot be secured where water stands for weeks within a foot of the surface, during the growing season. People are not generally aware also that large trees near a strawberry bed are very injurious, on account of the water they take from the soil.

The ideal preparation is first to drain and grade the bed, in the fall. Then cover the surface with manure; and in the spring rake off all trash; and then make fine the soil to the depth of six inches. . . . If one has any doubt about the fertility of land, in the spring, just before the plants come into bloom, apply a few hundred pounds of a good fertilizer per acre.

Two hundred pounds of nitrate of soda, when about half the fruit has set, will add to the crop and to the luxuriance of the plants. I am satisfied from long experience that a good coat of manure applied in the winter is one of the best methods to get a good crop of strawberries. Lime should never be used on land for strawberries, nor a very large amount of unleached wood ashes.

Strawberries require a great deal of water, and when the rainfall is insufficient, some form of watering must be resorted to. In a home-garden bed, this can be accomplished by dig-



COMPOSITION OF THE STRAWBERRY

ging holes every two feet in the row, and pouring from one to two quarts of water into each hole. To prevent evaporation, draw a little dry earth over the moistened place. As sprinkling merely moistens the top soil and causes the ground to cake, it is not a satisfactory method of supplying water. Moisture can also be conserved by continual stirring of the soil, for this cultivation causes the top layer to act as a mulch, and prevents the escape of moisture from below. Commercial growers resort to irrigation, by which the water is distributed through the fields in a series of V-shaped troughs.

Strawberry Enemies. The strawberry is attacked by several insect pests and by various fungous diseases. Among the latter is blight, or rust, which forms small purple spots on the leaves. Bordeaux mixture (see INSECTICIDES AND FUNGICIDES) is a standard remedy for all fungous diseases. Destruction of affected plants and the burning over of old beds are recommended as aids in fighting grub insects. The strawberry weevil, especially troublesome in the Southern states, is a small black beetle that preys on buds and blossoms. It may be destroyed by applications of white hellebore and kerosene emulsion. Kerosene emulsion is also recommended for killing the strawberry leaf roller, a small, yellowish caterpillar that attacks the leaves. B.M.D.

Derivation. Cultivated strawberries are derived from three species, or stocks—one from Europe, one from the United States, and one from Chile. The American has the finest flavor; the Chilean gives the

largest berries. These are species of the genus *Fragaria*. The common wild strawberry is *F. virginiana*.

STRAWBERRY SHRUB. See CALYCAN-THUS.

STRAWFLOWER. See EVERLASTING FLOWER.

STREATOR, stre' tor, ILL. See ILLINOIS (back of map).

STREET CALLED STRAIGHT. See DAMASCUS.

STREET RAILWAY. See ELECTRIC RAILWAY.

STREETS. See ROADS AND STREETS.

STRENGTH OF MATERIALS, a term used to indicate the resistance offered by such materials as stone, wood, and steel to stresses tending to change their shape. In the construction of buildings, it is necessary to select the material which will best withstand the particular stress to be exerted upon it. Materials differ greatly in this respect. Several sorts of stress are usually distinguished. There is a *tensile*, or stretching, stress, resistance to which is known as tensile strength. *Compressive* strength is resistance to such crushing masses as pillars support. *Shearing* strength is resistance to forces acting transversely to the material. In addition to these, there is a *torsional*, or twisting, stress, but this is really a combination of the larger classes first named. Still other stresses are occasionally distinguished.

Ingenious machines have been devised for testing the strength of materials, the strain applied being that to which the material will be most subjected when in place. Materials are said to have elasticity, and the limit of elasticity is not exceeded as long as the material resumes its shape when the stress is removed. When, however, the material becomes "set," it is said to have reached the *yield point*; and in building, the stress at the yield point, rather than the breaking point, is what concerns the contractor.

Steel and wrought iron offer the stoutest resistance to pulling strains. Wood, which does not bear a great tensile stress, has what is known as a greater elastic range than steel or iron; that is, it bends more under a given pressure. The strength of wood depends upon its weight, the heavier woods being usually also the stronger. Most materials will withstand a severer crushing than pulling strain, but this is not true of wood. Cast iron will withstand a very heavy crushing strain, and for that reason it is commonly employed in the spans of bridges and in the foundations of modern buildings. The tenacity of materials is put to the hardest test under twisting strains. In order to combine strength with lightness, materials are often cast in hollow form.

The strength of materials can be expressed in figures with only a rough approximation to

exactness, because the strength varies with different specimens. In engineering work, actual tests determine the fitness of any material to withstand the stress to which it will be subjected. The tensile strength of such woods as white oak and chestnut is about 12,000 pounds to the square inch; that of hemlock, red oak, and white pine, about 8,000 pounds. The crushing strength of white oak is about 8,000 pounds to the square inch, and that of the other woods mentioned is between 5,000 and 8,000 pounds. Portland cement has a tensile strength of about 700 pounds to the square inch, and ordinary structural steel has a tensile strength of from 60,000 to 70,000 pounds per square inch. The table of estimates given below was prepared by William C. Unwin, an English authority on the subject:

STRENGTH OF MATERIALS, IN POUNDS,
PER SQUARE INCH

MATERIAL	TENSILE STRENGTH	CRUSHING STRENGTH	SHEARING STRENGTH
Cast iron	from 30,500 to 10,800	130,000 50,000	12,000 8,700
Wrought-iron bars	from 67,000 to 33,500	(average) 50,000	49,000 22,400
Steel plates	from 65,000 to 110,000	.. ..	50,000 83,000
Steel boiler plates	60,000	..	50,000
Rivet steel	65,000	..	55,600
Copper, rolled plates	31,000	..	..
Copper, annealed wire	45,000	....	..
Brass	from 17,500 to 29,000	.......	....
Cast zinc	7,500	....	....

STREPTOCOCCI, *strep toh kok' se*. See BACTERIA AND BACTERIOLOGY (Kinds).

STRIKE, the action of a body of laborers in ceasing work in order to force an employer to grant their labor demands. It has always been the chief weapon of labor organizations. When employees leave their work, not because of dissatisfaction with their own condition, but to make their employer bring pressure upon another employer whose laborers have already struck, their act is known as a *sympathetic strike*. A *general strike*, such as occurred in England in 1926, is a concerted withdrawal from work by laborers in numerous and diverse trades, sometimes to achieve economic ends, and sometimes political ends. A *lockout* is the reverse of a strike; that is, it usually results from a strike, and is the refusal of an employer to permit his employees to work until they have submitted to his terms.

Picketing is a method used by strikers to prevent others from taking their places. The picketers take positions outside the factory or other working place, and try to persuade

strike-breakers to refuse to work. Employers may make use of *injunctions* to enjoin any who attempt to interfere with the operation of the plant. E.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Collective Bargaining	Labor Organizations
Eight-Hour Day	Open Shop
Injunction	Sweatshop System

STRIKE, in geology. See DIP.

STRINDBERG, AUGUST (1849-1912), one of the foremost Swedish writers of modern times. His literary output is difficult to classify, because it represents such a variety of interests and so many schools of thought. A man of extraordinary mental energy, he was constantly stimulated by a craving to investigate new intellectual fields. Strindberg was the son of an obscure tradesman of Stockholm. He studied at Upsala University, but left that institution without taking a degree. Thereafter he taught, engaged in newspaper work, tried his skill on the stage, and was otherwise busy. In 1878 his first important play, *Master Olof*, was produced, after it had been changed to please the theater managers, who had refused it six years before. The work was of value because it started a revolt against time-honored traditions in Swedish literature. The next year appeared his novel *The Red Room*, which revealed his gift for sarcastic expression of opinion and realistic description.

Once started on his literary career, Strindberg worked with superhuman energy, but for two years (1895-1897) was idle because of a mental breakdown. At various times he was a realist, a romanticist, a skeptic, and a mystic. He was also a zealous advocate of the theory that woman is inferior to man, mentally, physically, and morally.

His Varied Genius. Strindberg's numerous writings, in addition to those named above, include *A Fool's Confession* (autobiographic in character); *The Natives of Hemsö*, a novel of Swedish peasant life; *Fisher Folk*; *Utopias Realized*, a plea for socialism; *Speeches to the Swedish Nation*; and the plays *Gustavus Adolphus*, *The Father*, and *Lucky Pehr*.

STRINGED INSTRUMENTS. See ORCHESTRA; MUSICAL INSTRUMENTS.

STRINGER, ARTHUR [JOHN ARBUTHNOT] (1874-), a novelist and writer of short stories, was born in London, Ont., and was



Photo: P & A

AUGUST STRINDBERG

educated at the universities of Toronto and Oxford (England). His belief that a fluent imagination requires the stimulus of an active life, and his desire for experience of all kinds led him into newspaper-reporting in New York City, from which grew his first volume of short stories, *The Loom of Destiny*. He was editorial writer for the American Press Association from 1898 to 1901, and literary editor of *Success* in 1903-1904. Since his first employment in New York, he has lived in the United States.

Several novels were inspired by his travels to far corners of the world, and out of a disastrous venture in fruit-farming, in Western Ontario, and one equally unfortunate in wheat- and tobacco-growing, in the Alberta foothills, came a trilogy dealing with ranch life—*The Prairie Wife*, *The Prairie Mother*, and *The Prairie Child*. This series is marked by excellent character portrayal and a sympathetic understanding of the trials of a pioneer family.

His Principal Books. Besides the books mentioned, Stringer has written *The Silver Poppy*, *The Wire Tappers*, *Phantom Wires*, *Empty Hands*, *A Study in King Lear*, *Pauline and Other Poems*, and numerous mystery stories. He contributed fiction regularly to magazines. See CANADIAN LITERATURE (English Canada).

STRONGBOW, nickname of the Earl of Pembroke. See IRELAND (History: The Coming of Invaders).

STRONTIUM, *stron' shih um*, first found in the lead mines of Strontian, Argyllshire, Scotland, is a pale-yellow metallic element whose compounds occur in small quantities in rocks, soil, and mineral waters. It is harder than lead; is ductile and malleable, that is, capable of being drawn into a wire and hammered into a sheet; and gives a brilliant crimson flame. Strontium and barium (which see) resemble each other very closely. Strontium hydroxide is used to extract sugar from molasses in the beet-sugar industry. The nitrate is used in fireworks, because it colors a flame crimson. "Red fire" is a mixture of potassium chlorate, shellac, and strontium nitrate. Other compounds are used in medicine. The chemical symbol for strontium is *Sr* [see CHEMISTRY (The Elements)]. T.B.J.

STRUCK COINS. See NUMISMATICS.

STRUCTURALISM. See PSYCHOLOGY (Modern Movements).

STRUGGLE FOR EXISTENCE. See EVOLUTION; NATURAL SELECTION.

STRYCHNINE, *strik' nin*, or *strik' neen*, a very bitter, poisonous drug with powerful stimulating properties, obtained from the seeds of the nux vomica and kindred plants. In doses one-sixtieth to one-fifteenth grain, it is often prescribed as a tonic; and is given as a stimulant in cases of acute diseases where collapse is imminent, for it increases the flow of digestive juices, directly affects the spinal

cord, and indirectly affects the heart and lungs. One-eighth-grain dose will kill a dog; three times as much causes spasms in man; and one grain is usually fatal. The symptoms—violent twitching, difficulty in swallowing, and convulsions, during which the body is bent backward—appear in about twenty minutes, and death may result in two hours from suffocation or exhaustion. A stomach pump or an emetic should be used at once. So dangerous a drug should never be taken except under the advice of a competent physician.

Related Subjects. The reader is referred in these volumes to the following articles:

Alkaloids Antidote Nux Vomica

STUART, CHARLES EDWARD (1720-1788), called the YOUNG PRETENDER, BONNIE PRINCE CHARLIE, and the YOUNG CHEVALIER, was the eldest son of James Edward Stuart and the grandson of the deposed James II of England. He was born in Rome. James Edward, known as the OLD PRETENDER, was the son of James II by his second wife. In 1745 Charles Edward made a determined effort to win back the English throne for the Stuart family. Although he was aided by the Highland clans of Scotland and gained some successes, there was no uprising in England in his favor, and in 1746 his army was defeated at Culloden Moor. The prince escaped to France, after many thrilling adventures. His life thereafter was one of dissipation, and was spent chiefly on the Continent. He died in Rome. See STUART, HOUSE OF.

STUART, GILBERT (1755-1828), an American painter of the early national period, whose portraits of Washington are the most famous of all likenesses of the first President. Stuart executed at least forty portraits of Washington, the first in 1795. Every one is familiar with the so-called "Athenaeum" head, showing the left side of the face. A full-length picture—*Washington at Dorchester Heights*—is also well known. Both of these are in the Boston Museum of Fine Arts. The Metropolitan Museum, in New York, possesses the famous "Gibbs-Channing" portrait. Another of the series was purchased by popular subscription for the Chicago Art Institute, in 1924.

Stuart was born near Newport, R. I. He began to paint when a boy of thirteen, without

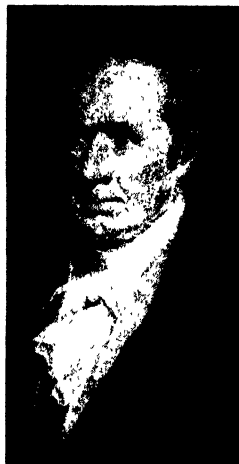


Photo: Brown Bros.

GILBERT STUART

any guidance, and though he had begun to accept commissions before 1775, he had little opportunity to study under good masters until that year, when he went to London. Between 1778 and 1782, he lived and worked with Benja-



STUDIO OF GILBERT STUART

It was in this building, near Philadelphia, that he painted many of his Washington portraits.

min West, his countryman. After winning a name in London and Dublin as a fashionable portrait painter, he returned to America, his chief reason for this move being his desire to secure Washington as a sitter.

Stuart painted the first Washington head in Philadelphia. Later, he lived in Washington and in Boston, and he died in the latter city. While in Europe, he painted George III and the future George IV, Louis XVI of France, Sir Joshua Reynolds, Benjamin West, and the famous actress Mrs. Siddons. Among other sitters were the four Presidents following Washington, and John Jay and Jerome and Madame Bonaparte. Stuart's paintings are notable for their purity and delicacy of coloring.

STUART, House of, a royal dynasty of England and Scotland, the members of which in theory and practice were exponents of the principle that "the king can do no wrong." The first Stuart to rule over England was James VI of Scotland, son of Mary, Queen of Scots. In 1603, on the death of Elizabeth, last of the House of Tudor, James ascended the throne of England as James I, thus bringing the two countries under one sovereignty. His successor, Charles I, ruled so despotically that he was deposed and beheaded, and a commonwealth was established (1649). In 1660 the family was restored to the throne in the person of Charles II, son of Charles I. In 1685 James II, brother of Charles, became king. He applied the divine-right theory so recklessly that, in 1688, he was deposed by a bloodless revolution, and the crown was bestowed on his daughter Mary and her husband, William of Orange, the two becoming joint rulers of the kingdom. In 1702 Anne, sister of Mary, suc-

ceeded to the throne. She was the last Stuart ruler. In her reign, Scotland and England were united. See table, page 6882.

Related Subjects. The reader is referred in these volumes to the following articles:

Anne	Mary (II, England)
Charles (I and II, England)	Mary Stuart
Divine Right of Kings	Scotland
Elizabeth	Stuart, Charles Edward
James (I and II, England)	William (III, England)

STUART, JAMES EWELL BROWN (1833-1864), a dashing cavalry officer in the Confederate service during the War of Secession. He was born in Patrick County, Va., and was graduated in 1854 at West Point. In 1857 his regiment was sent to Kansas to enforce order, and he also saw service against the Cheyenne Indians. He resigned from the Federal army in 1861, when Virginia seceded, and was commissioned lieutenant colonel of Virginia troops, first winning distinction at the first Battle of Bull

Run. He was commissioned major general of cavalry in 1862, and during the Battle of Antietam made a raid into Pennsylvania. He aided Stonewall Jackson at Chancellorsville, and commanded that general's corps temporarily, after Jackson's tragic death. In the Wilderness campaign, Stuart was successful in several engagements. He was mortally wounded at Yellow Tavern in 1864, in attempting to check the advance of Sheridan against Richmond. See **WAR OF SECESSION**.

STUCCO, *stuk' o*, a term applied to various compounds used for interior decorating and as a surfacing for the exterior of buildings. That used for inside decorating is a fine plaster composed of gypsum and glue water or of pulverized white marble and fine sand, gypsum, and water. It lends itself readily to polishing and finishing, and gives beautiful effects. Imitation marble is a form of stucco. Stucco was employed quite generally as a decorative medium by the Greeks and Romans, who often shaped it, while plastic, to form designs in relief.

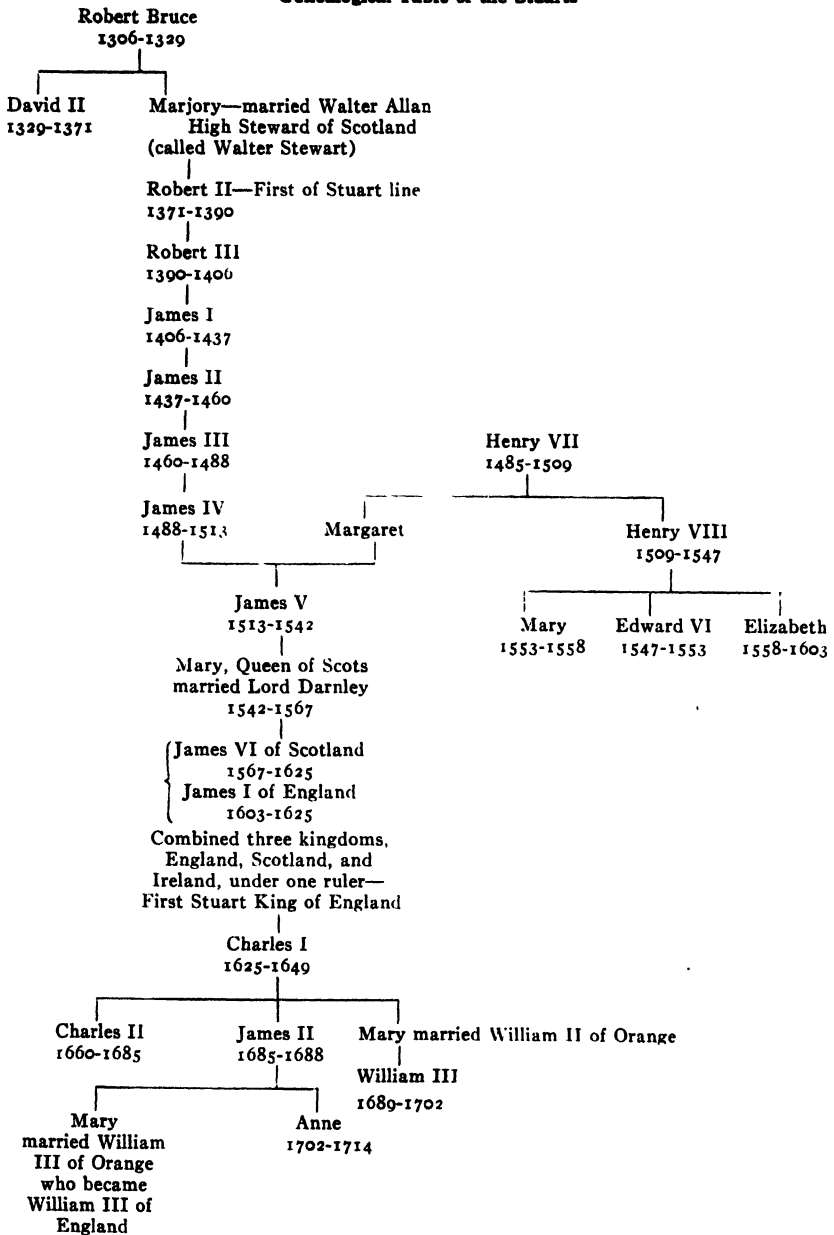
Exterior stucco is much coarser, and contains a considerable amount of cement. It is now used extensively as a surfacing material for modern houses, both for bungalows and for large and pretentious homes. It has the advantage of being durable and attractive, while it is much less expensive than stone. A cheap form of plaster used in the construction of exposition buildings is known as *staff* (which see).



Photo: Brown Bros.

J. E. B. STUART

Genealogical Table of the Stuarts



STUNDE, the Swiss mile. See MILE.

STURGEON, *stur' jun*, the common name of a family of large fish inhabiting fresh waters and seas of the North Temperate Zone. They are caught for their flesh, which is usually smoked, and for their eggs, which are used in the preparation of caviar (which see). From the bladder of the Russian sturgeon a superior quality of isinglass is obtained. These fish

have slender, elongated bodies covered with rows of bony plates. There is a long snout, beneath which is a small, toothless mouth with thick, sucking lips. There are four barbels in front of the mouth. The head, like the body, is well protected with plates. A single dorsal fin grows on the back, and the tail is forked, the lower lobe usually being shorter than the upper. Most of these fish migrate

from salt water into streams in the spawning season, though some species are permanent denizens of fresh waters. Their food, consisting of small marine animals and plant life, is sucked into the mouth.

One of the best-known species is the *common sturgeon*, found in European waters and along the American coast from Maine to South Caro-



THE STURGEON

lina. The largest specimens are ten feet long and weigh as much as 500 pounds. Other species include the *white sturgeon*, of the American Pacific coast, the largest American fish of this group; the *lake sturgeon*, a denizen of the Great Lakes and of the Mississippi Valley waters; and the great Russian *beluga*, which sometimes reaches a weight of 3,000 pounds. This fish has furnished the greater part of European caviar. Another Russian sturgeon, the small *sterlet*, is also the source of this delicacy. The North American sturgeons are rapidly diminishing, because of indiscriminate fishing. L.H.

Scientific Names. The common, white, and lake sturgeons are, respectively, species *sturio*, *transmontanus*, and *rubicundus* of the genus *Acipenser*. The beluga is *A. huso*; the sterlet, *A. ruthenus*.

STURGEON, WILLIAM. See ELECTRO-MAGNET.

STURGEON RIVER. See MICHIGAN (Its Rivers).

STUTTERING. See STAMMERING AND STUTTERING.

STUTTGART, *shloot' gahrt*. See GERMANY (Principal Cities).

STUYVESANT, *sti' ve sant*, PETER or PETRUS (1592-1672), the last Dutch governor of colonial New York, or New Netherland, as it was then called, was born in Holland. The exact place of his birth is not known, nor are any facts about his youth and education to be obtained. It is certain that he served as a soldier in the West Indies, and at the age of forty-two was director or governor of one of the colonies founded on those islands by the Dutch West India Company. In 1644 he lost a leg while leading the Dutch against the Portuguese on the island of Saint Martin, and the company, as a reward, made him governor of New Netherland.

He arrived at New York in May, 1647, and immediately began to make enemies by his

arbitrary methods. Undoubtedly, however, he restored order and business confidence and quieted the Indians, who had been treated without mercy by the previous governor, William Kieft. In 1650 he settled with the New England colonists the northern boundaries of the Dutch colony, and further aroused the wrath of his subjects by granting too much territory to the Puritans. Five years later, he captured all of New Sweden, including the present state of Delaware, and made it a part of New Netherland.

Stuyvesant was unbending, and had unbounded confidence in himself. When, in 1653, a convention of Long Island citizens demanded a share in the government, he replied: "We derive our authority from God and the Company, and not from a few ignorant subjects."



PETER STUYVESANT

From an engraving after the painting by Van Dyck. The original is owned by the Stuyvesant family, New York City.

In 1664 an English fleet ordered the surrender of the city, and, after resisting a few days, Stuyvesant yielded, on September 8. He afterward settled down on his farm, or *bouwerij*, part of which is now known as the Bowery, in New York City. He died on this estate, and lies buried on the site of Saint Mark's Church. The beautifully carved and inscribed stone which covered his grave is built into the wall

of the church. Irving, in his *Knickerbocker History of New York*, has given Stuyvesant lasting fame.

STYLE. See the article **FLOWERS** (Flower Structure).

STYLITES, *sti li' tees*, SAINT SIMEON. See **MONASTICISM** (Christian Monasticism).

STYLUS. See **PEN**; **CUNEIFORM INSCRIPTIONS**.

STYPTIC, *stip' tik*. See **FIRST AID TO THE INJURED**.

STYRIA, *steer' ih ah*, a province of the Austro-Hungarian Monarchy before 1918, and now a division of the present republic of Austria. See **AUSTRIA**.

STYX, *stiks*, in Greek and Roman mythology, the dreary and pestilential river that flowed seven times around Hades, the abode of the dead. Across it the departed spirits were rowed by the ferryman Charon, to the realms of Pluto, who assigned them either to Elysium (Elysian Fields) or to the grim regions of Tartarus. A lofty waterfall in Arcadia was also known as the Styx. Its waters were supposed to be poisonous, and its barren surroundings suggested the entrance to the lower world.

Related Subjects. Information additional to the above will be found in the following articles:

Charon Elysium Tartarus

SUBANSIRI RIVER. See **BRAHMAPUTRA RIVER**.

SUBCLAVIAN, *sub kla' vih an*, **ARTERY AND VEIN**. See **BLOOD**, color plate.

SUBCONSCIOUS, *sub kon' shus*, **THE**. About the term *subconscious* center many important phases of mental conduct. The realm of the subconscious includes the many motives, feelings, and impulses that affect behavior without reaching full consciousness; it emphasizes the significance of a variety of the mind's occupations without which human nature, normal and abnormal, cannot be understood. Consciousness has arisen because it is necessary for certain higher types of reaction. If rightly disposed, it is most helpful; if wrongly applied, it becomes harmful. Consider physiological functions: We have just as much awareness as is good, and no more. We attend just enough to the sensations accompanying eating to swallow our food; if we put too much attention upon swallowing, it suffers—hence the difficulty in swallowing a pill. We walk best when we walk naturally; one does not walk naturally (which means with a right distribution of consciousness) when coming in late at church or theater, with the eyes of the assembly upon one. The stiff expression so often seen in photographs reflects the consciousness of having one's picture taken.

All this illustrates the delicate relation between consciousness and conduct. Overconsciousness of one's digestion makes the nervous

dyspeptic; but the complex varieties of consciousness depend upon social training. The free "unconsciousness" of childhood gives way to increasing experience. The age of self-consciousness is physiologically determined; the shyness of young men in the presence of young women is deeply regulated by all the complicated reactions of sex.

Most of our acquired habits are given over to subconscious guidance. It is common to remark that, without observing, we cannot tell how we dress, how we know where to reach for the knob of a door, how we manipulate a typewriter or a sewing machine. Yet, at one stage of learning, all these actions were slow, deliberate, and conscious. It is equally common to observe that these mechanisms, on occasion, run themselves. When a man upon touching his watch, in dressing for the evening, begins to wind it and then to undress and go to bed, we call the lapse a case of absent-mindedness, and say that he does this un(sub)consciously. When we mislay an article, and try to think how and when we disposed of it, we are trying consciously to follow the clue of our subconscious responses. Such states are characteristic in that they show a division of attention. While dominantly attentive to one action, we carry on another inattentively. In extreme absent-mindedness, sensations do not yield their normal report, and actions are performed without normal awareness of their regulation. The man who carried a closed umbrella under his arm in a rainstorm, because he was convinced that he forgot the article when he left home, ignored the sensations that, in a normal state of consciousness, he would have received from the umbrella; and yet he maintained the contractions of the arm muscles necessary to hold the umbrella; these also were defectively perceived.

Absent-mindedness is a state of dissociation, slight or deep; at the slightest, it gives rise to confusion due to lax attention, such as the instance of the young lady in the train who was eating a banana when the conductor collected tickets, and threw her ticket out of the window, while offering the conductor the banana peel. In more severe dissociations, it approaches a dream state or a trance. It appears spontaneously in sleepwalking; the sleeper is attentive to the line of action upon which he is bent, but inattentive to all else. To awaken him means to restore him to normal consciousness. It appears still more strikingly in hypnosis (see **HYPNOTISM**), in which the range of consciousness can be definitely controlled by suggestion. The hypnotized subject sees, hears, and feels only what is related to the action suggested; his state is abnormal in that he ignores obviously present objects if it be suggested that they have disappeared. Upon awakening, he may have no recollection of anything done in the hypnotic state.

Throughout this range of observations, it is to be noted that subconscious processes are at work. They are at work constantly to facilitate habits; in speaking in public, we focus the attention upon the ideas we wish to express, and the subconscious mechanisms take care of the formation of the words and their utterance. Some persons talk in their sleep, so subconscious has the regulation become. Though concentrated upon one central task, we are giving fractions of attention to our surroundings, to our bodily condition, to the engagements ahead, and to the routine of daily life. The relations become more interesting in the unusual cases, such as automatic writing or crystal-gazing. In the latter case, the subject supports and clarifies the subconscious impressions, bringing to the surface what commonly is vague and near the edge of forgetfulness. Every mind is stored with vast accumulations of impressions which cannot be consciously commanded, but which none the less contribute to the imagery, the ideas, the memories, that guide thought. The crystal-gazer, also the hypnotized subject, can "tap the subconscious," as it were, more fruitfully, and thus raise the impressions to a conscious value.

The subconscious plays its part in the field of sensation, in the field of memory, and in the organization of knowledge, but even more strikingly in the field of action. The subconscious there becomes the subvoluntary; or, more simply, some irregularity of action and report enters. When one finds, on attempting to wind his watch, that he has already wound it, or, on reaching the house door at night to lock it, that he has already locked it, the action and intention failed to be registered as usual. When persons are assembled about a table with their hands resting on it, and solemnly maintain that no one exerted the slightest pressure, yet the table moved violently and even rose in the air, the actual contractions of their muscles are ignored. (They are ignored through the conviction—which acts as a powerful suggestion—that some outside force is responsible for the movement.)

Prejudice blinds to virtues and failings alike; it selects what it shall see; it also ignores movements and intentions. In a more subtle manner, the same procedure determines mind reading (which see), which is really muscle reading. But the movements of the table through the subconscious (ignored) contractions of the hands that rest upon it lack any intellectual expression; they proceed upon a powerful emotional interest. When, however, the hand is laid upon a small tripod and moves from letter to letter over an alphabet (ouija board), and thus spells messages in consecutive sentences (while still the sitter claims ignorance of intention or selection of movement), the performance has a more intricate meaning.

For the ideas which guide the movements are also subconsciously inspired and regulated. If the instrument holds a pencil and writes (planchette), the messages are more fluent, while in automatic writing, the hand itself may write elaborate compositions, seemingly without the full conscious direction of the writer. In all these cases, the subconscious is the source of idea and expression.

Cases of this kind have always attracted attention. The most recent is that of "Patience Worth," which is a ouija-board revelation. Poems, prose narratives, dialogues of an elaborate character, with distinct literary merit and a quaint phraseology, are recorded, and fill a volume of subconscious automatic production. The writer is unaware of the source of the ideas which are "incubated" and reach expression in this roundabout manner. They are ascribed to a foreign agency, and in most cases have reference to spirit origin (see SPIRITUALISM). Equally striking is the automatic and dramatic action in a trancelike state. The most remarkable of these likewise requires a volume for its record. The subject develops several cycles of impersonation. In one she is an Indian princess; in another an inhabitant of the planet Mars; in a third the reincarnation of Marie Antoinette. As a Martian she develops a language (founded upon French, which alone she knows) and describes the life on Mars. The interpretations are made through a "medium" (also personified) who is really the means by which the subconscious communicates to the conscious self. Upon awakening from this trance, the subject is unaware of the drama that she has enacted.

It is suggestive that in such instances the subconscious, detached procedures do not affect the conduct of waking life. When this occurs, the normal life is disturbed, and we have cases of divided personality. One state with one set of memories, of tastes and inclinations, of desires and habits, is now in the ascendant; and again it falls away, and another person with quite opposite character takes her place. Such is hysterical instability. The one state is in ignorance of what the other does; but it can be definitely established that the relation of the two states is such that what is conscious to the one is subconscious to the other. An avenue of communication may be found; and when the two "characters" may be reconciled and merged, a cure takes place. The extreme to which states of conflict may be carried are almost incredible; but such instances cannot be summarized.

Cases of a different type are those, reported from time to time, in which a sudden lapse of personality ensues, and a man wanders from home, is unaware of his previous life, settles in a new region, possibly in the same occupation as he formerly exercised, or it may be in a

very different occupation; then suddenly comes to himself, unfamiliar with his new surroundings and oblivious of his recent life. Such divisions of the personality—between functions retained and those lost—may afford a clue to the nature of the defect, but as frequently leave unexplained the exact injury that the brain has suffered. It is established that the set of memories in abeyance is really subconsciously retained; the two states react much in the manner of alternating personalities, in cases of incomplete fusion.

Normal characters represent a useful support and relation of conscious and subconscious factors; abnormal characters represent the failure of such relation. Typically, these result from conflict; and such conflict-motives have prompted the view of Freud and others that the subconscious is constantly seeking and achieving expression as unfulfilled wishes and incomplete repressions. It is held that a dream is such a procedure. It has one meaning at its surface in the incidents of the dream; and another, deeper and latent, in terms of desires that are suppressed and reach expression in disguise by the dream route, when the conscious censor is asleep.

Every one harbors secret wishes, private hopes, imaginative ambitions—many of them suppressed by social training and the harsh conditions of existence—which form phases of character in conflict with the conscious life that commands. Hysterical cases of divided personality and inconsistency are but exaggerated and irregular instances of the same relation. Freud believes also that the lapses of absent-mindedness express a suppressed intention. The value of his theory lies largely in the search for such inner conflict which it has aroused in cases of nervous and mental trouble; for when once the subconscious source of irritation is found and made conscious, the conflict disappears. The use of the analyses of dreams and other mental states to determine the hidden source of conflict is called psychoanalysis. In a large number of cases, the conflicts center about the life of sex, because this is at once a most powerful emotional realm, and one concerning which society imposes rigid repressions.

However viewed, the realm of the subconscious—especially for the emotional life, but hardly less so for the intellectual—is of large significance for the understanding of mental behavior. Both in its supports and in its conflicts, the subconscious discloses the intimate sources of mental life. It must not be thought of as an independent or mysterious agency—a subconscious self that is a double of the self we know—but as an integral phase of the unified self that we recognize as the individual character. The abnormal cases, it is true, suggest independence and division; but the theory of dissociation establishes the gradual links from

normal to abnormal that make clear that one relation is responsible for the whole series. Many points remain obscure, and the temptation to fly to extreme hypotheses is strong. It is part of the success of modern psychology to have rescued the realm of the subconscious from confused and superstitious views, and to have brought it in line with the central facts of human nature.

J.J.

Relating to Various Beliefs. The articles on the following topics, while all do not bear directly on the subject treated above, are of interest in this connection:

Alchemy	Occult
Astrology	Palmistry
Clairvoyance	Phrenology
Conjuring	Physiognomy
Demonology	Psychical Research
Divination	Psychoanalysis
Faith Cure	Spiritualism
Hypnotism	Suggestion
Magic	Superstition
Medium	Telepathy
Mesmerism	Theosophy
Mind Reading	Trance
Necromancy	Witchcraft

SUBJECT, in government. See CITIZEN (A Citizen of Canada).

SUBJECT (in grammar). See SENTENCE (Parts of a Sentence).

SUBJECTIVE MIND. See TELEPATHY.

SUBLIMATION, *sub lih ma' shun*, the process by which a substance passes directly from the solid state to the condition of vapor, without undergoing the intermediate liquid state. The substance is then said to *sublime*. A familiar illustration is the drying of frozen clothes, hanging on the clothesline on a very cold day. Under a certain pressure, ice changes to vapor, or sublimates, by heat without melting. Iodine, arsenic, and camphor are substances which sublime at atmospheric pressure. In industry, sublimation is used for purifying substances. In changing the substance to vapor, the impurities are left behind and the pure substance is obtained. The flowers of sulphur, that is, the common sulphur of commerce, afford one of the best examples of a substance obtained by sublimation. The flowers of benzoic acid and sal ammoniac are made by this process. See VAPOR; EVAPORATION. A.L.F.

SUBLIME PORTE. See TURKEY.

SUBMARINE, *sub ma reen'*, a vessel which travels under water, and whose chief practical use thus far in its history has been as a weapon of destruction. It ranks with the flying machine, a useful development of the arts of peace, among the new implements at the disposal of warring powers. Although submarines have not been put to commercial use to any great extent, the work of improvement which is constantly going on is of vast importance to the welfare of nations. Especially is this true, because the proposal that all nations should abolish submarines was not adopted when made at the Washington Disarmament

Conference, in 1921. Since then, the general trend in submarine construction has been toward increase in size, power, speed, and armament. While it is true that this underwater vessel is considered chiefly as a weapon of war, it nevertheless may be put to other practical uses, such as commercial missions. In 1924 a world voyage was undertaken by the largest submarine of that time. In 1930 a new French submarine was hailed as the largest in the world, measuring 426 feet in length, 33 feet 9 inches in width, and having a submerged displacement of 4,304 tons. Larger undersea boats have since been built.

The modern submarine is the invention of John P. Holland, an American, but it remained for European nations to bring it to a remarkable degree of perfection and efficiency. To Germany is due the credit of developing an undersea fleet which became the terror of the seas; the United States, which gave this craft to the world, has made much less use of the marvelous invention.

What the Submarine Is. The submarine is a kind of mechanical fish. Though it is neither so comfortable nor so commodious as the ship



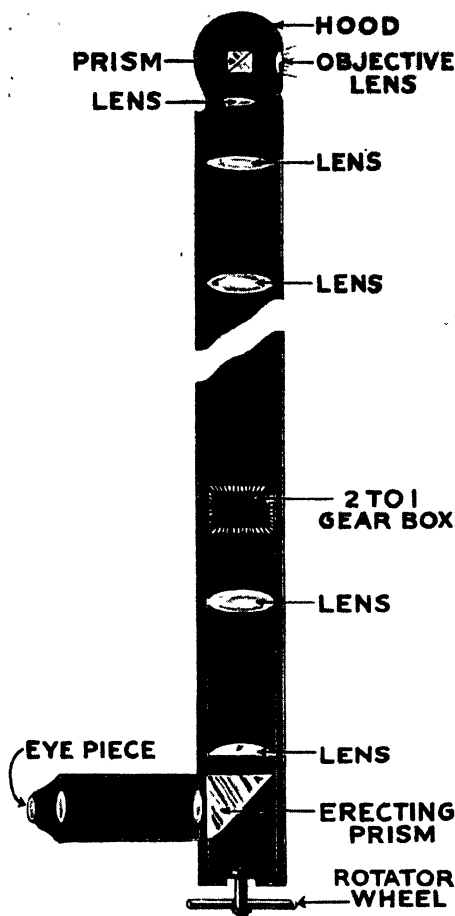
UNDER TWENTY FEET OF WATER

Photograph of a submerged submarine, taken from an airplane whose shadow appears on the surface of the sea.

described by Jules Verne in his engaging book, *Twenty Thousand Leagues Under the Sea*, nevertheless it can dive and travel under water, sinking, if need be, to a depth of 200 feet, where the pressure on each square inch of surface is 133 pounds, nine times as great as air pressure

at sea level; it is also capable of rising near to the surface, firing upon enemy ships, and diving again into the depths of the sea.

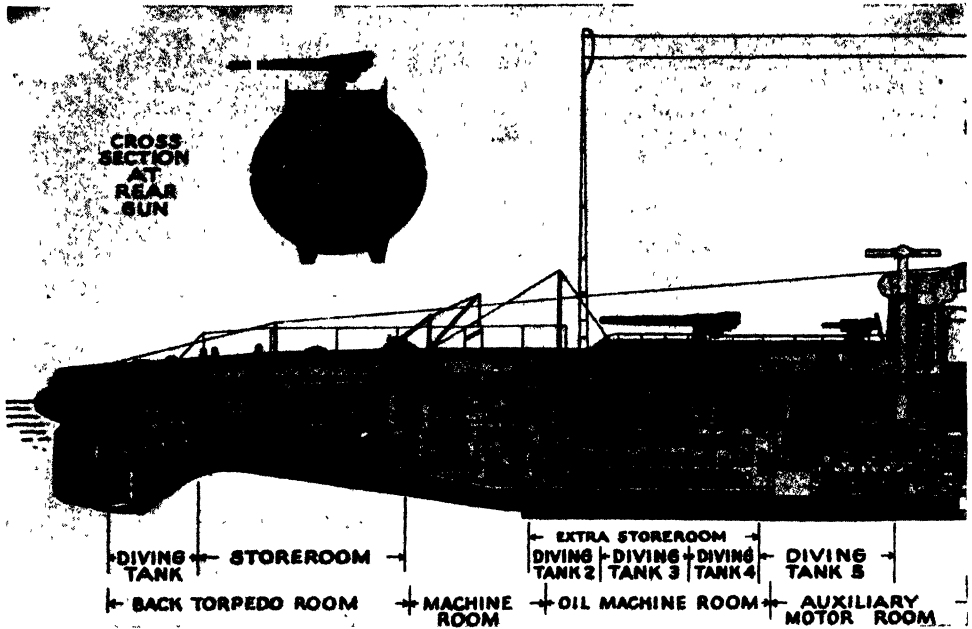
Early Modern Type. The Holland-type submarine afloat looks not unlike a huge cigar



DETAIL OF A PERISCOPE

of steel plates. It carries a conning tower, set in the middle of a flat deck tapering to a point at either end. In front of the conning tower is the periscope, which is the ship's eye when it is submerged. The periscope is a long, jointed pipe, fitted with reflecting mirrors, which can be extended twenty feet or so above the conning tower. Through this pipe the captain can command the part of the horizon in front of him, when he is under water (see PERISCOPE). The ventilators of the submarine are so built that they may be telescoped and the openings through the deck sealed.

Improvements. Since 1902, when the Holland type became known as the "A" class, many improved types have been developed,



LONGITUDINAL SECTION OF

the chief aim being to increase the endurance, power, speed, and habitability of the boats at sea, and to eliminate the risks, as far as possible.

Some of the chief features of improvement which have developed since the Class "A" type are:

- Twin screws driven by vertical, four-cycle Diesel engines, replacing the single-screw, driven by horizontal gas engines;

- Torpedo tubes placed vertically instead of horizontally;

- Stern torpedo tubes installed;

- External tanks adopted, to provide greater stability and endurance, and to make the submarines more habitable;

- Navigation bridge and deck house built over conning tower;

- Double hull introduced, to give greater safety in case of collision;

- Length, breadth, and armament increased;

- Length and size of periscope increased;

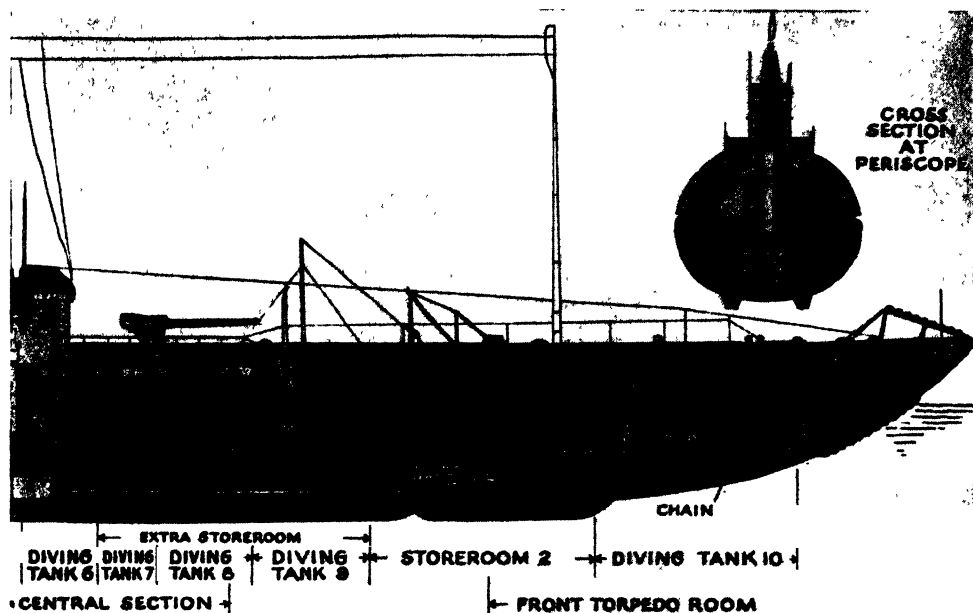
- Long-distance wireless installed;

- Telemotor system installed, for raising the periscope and telescopic masts, and for operating the ballast-tank vent valves.

Submarine Service. Early submarines were only 100 to 135 feet in length; to-day, they may be over 425 feet. The early vessels had a speed of about eleven nautical miles an hour on the surface, and about eight nautical miles an hour submerged. Vessels are now constructed with a speed of thirty to thirty-six nautical miles an hour on the surface, and fifteen when submerged. With so much machinery

stored in a craft of small dimensions, it can readily be seen that there is not much room left for the crew (see illustrated cross section of standard submarine). Space is, indeed, at a premium on board a submarine. Crowded into narrow quarters, unmercifully tossed by waves, surrounded by driving steel cranks and rods, and deafened by the pounding of the engines, the men must have strong nerves, under perfect control, to endure the strain to which they are subjected. The crews, therefore, are all picked men, drilled to the highest point of efficiency for the most perilous and nerve-racking service in the world. Notwithstanding this care in selection, few men in submarine warfare are able to remain long on duty.

In Action. When at anchor, the submarine shows two to four feet of dull-gray hull above the water. When racing on the surface through a lively sea, the whole craft is awash. It maintains then a speed ranging from twelve to thirty miles an hour. The motors drive the vessel through the water, "porpoising" at intervals, but running for the most part with only the periscope and ventilators showing to the enemy. When within 800 yards or so of hostile craft, the vessel comes suddenly close to the surface, lets drive its torpedo, and then sinks at once from sight. Before the end of 1917, German submarines had been so perfected that they could rise to the surface, discharge a torpedo, and submerge again, in less than one minute. Such efficiency made them a deadly menace to the enemy.



A MODERN SUBMARINE

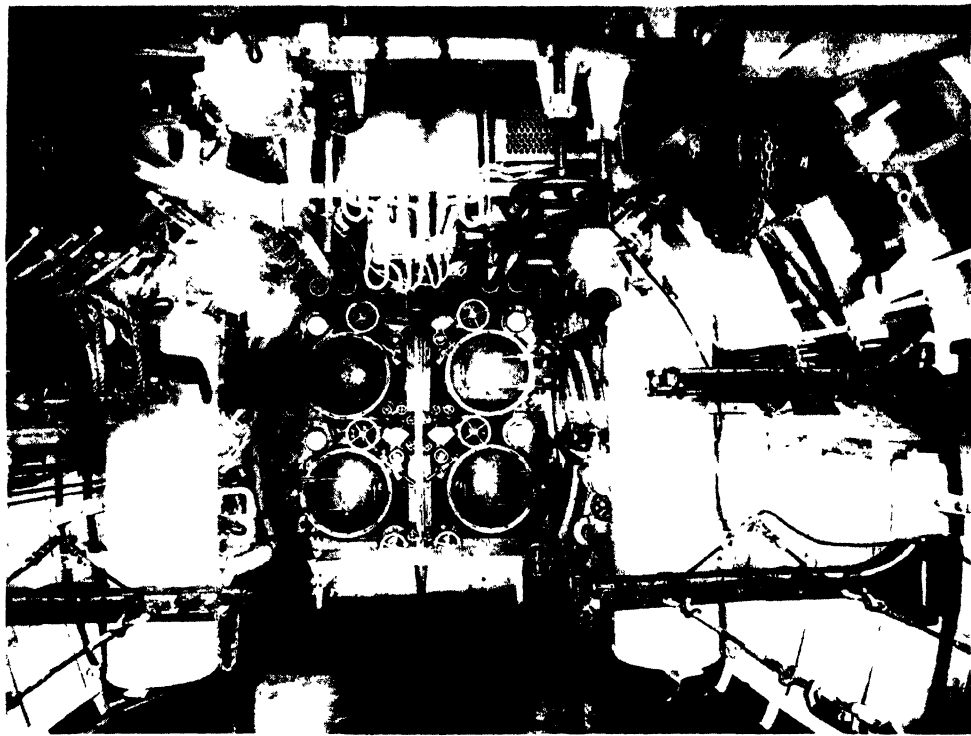
Protection of Ships. The great loss of shipping resulting from the submarine warfare conducted by Germany in the World War was a direct challenge to the ingenuity of the opposing nations. After the entrance of America into the war, Thomas A. Edison and others worked out a system of protection for ships that included the following expedients: Hard coal was used in place of soft coal as fuel, to lessen the cloud of smoke that makes a ship visible to a submarine for a distance of twenty-five miles. High masts and smokestacks were eliminated, and the sides of the vessels were disguised with a system of *camouflage*—that is, painted gray, or with a maze of zigzag colors that makes a ship unrecognizable by a submarine until within about a mile. A system of increased flotation was also devised, greatly diminishing the liability of sinking. When the submarine destroyers, small, swift boats manned by a few men, were put upon the seas in large numbers, to carry on offensive warfare, depth bombs were invented to destroy the submarine. These can be shot from guns, and they explode at a designated depth.

The hydrophone is also an efficient defensive device. It is an instrument which detects the presence and approximate location of a submarine by the sound of its engines. As its name indicates, the hydrophone is a kind of water telephone. It robs the submarine of much of its advantage of invisibility, and lessens its chance of making a surprise attack. It was invented by Dr. Max Mason (which see).

Another method of defeating the submarine is a system of convoying merchant and passenger ships with destroyers. This method was so effective in the World War that not one of the ships carrying American troops to Europe was torpedoed.

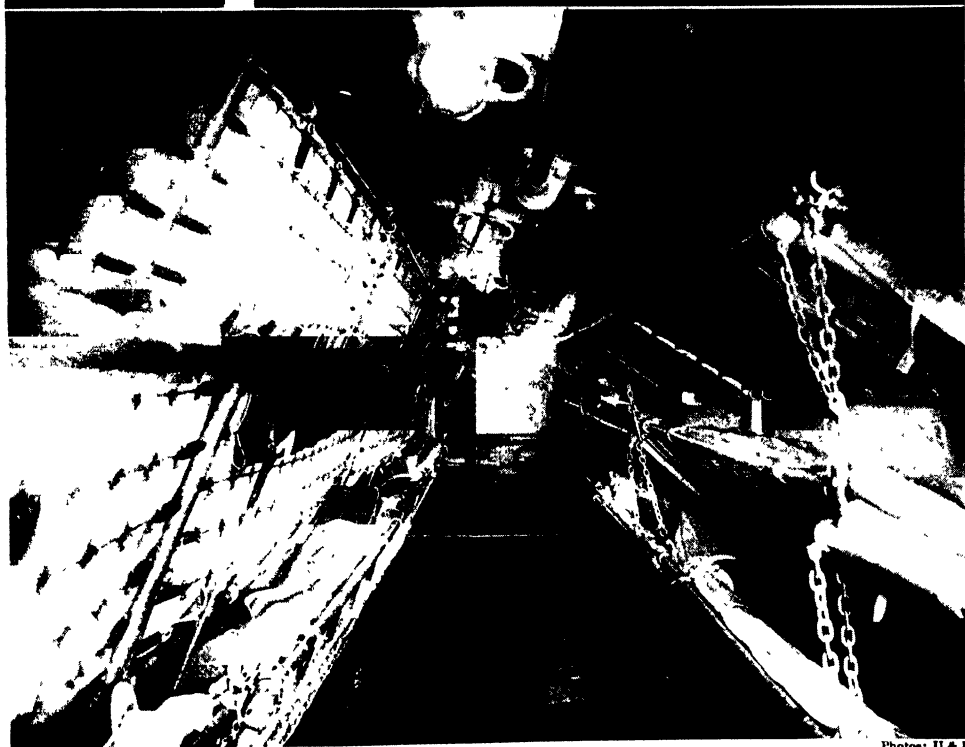
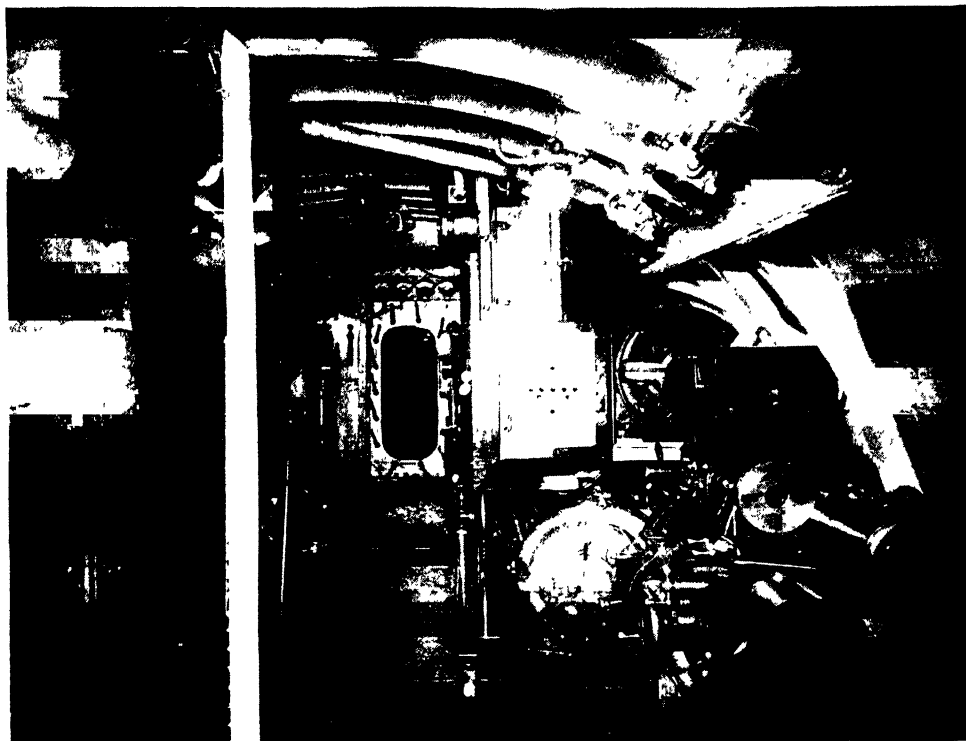
Another efficient anti-submarine device, called the *paravane*, was developed during the World War by a British naval officer; subsequently, an adaptation was worked out to be used to protect vessels from submarine mines (see SUBMARINE MINE). The first-mentioned, known as the *explosive paravane*, consists of a charged, cigar-shaped mine, submerged at the proper depth and towed by cables from the sides of a ship, and deflected away from the ship by vanes on the instrument; the distance between the paravanes and the vessel is further increased with the speed at which they are towed. The mine may be controlled from the ship or it may explode upon contact with a submarine. The tow line also acts to catch the submarine and carry it along, until it strikes the paravane. Two paravanes are used, one on each side of the vessel.

History. The submarine, like the airplane, has been long a dream of man. The first vessel of the type is said to have been constructed by a Dutch physicist, Cornelius van Drebbel, who in 1624 exhibited it in the Thames and even invited King James to have a ride with him. The boat was built of wood and propelled by twelve rowers; little else is known about the original submarine.



Photos: U & U

Crowded Interior of a Submarine. (L.) Machinery occupies almost all the space in undersea ships. Above, the torpedo room; torpedo tubes are in the center of the photograph. Below, a view in the engine room.



Photos: U & U

Crowded Interior of a Submarine. (II.) Above, a view in a motor room. Below, sleeping quarters for the crew. When the bunks are lowered, there is but little passageway. 6891



Photos: U & U; Wide World

THE WARTIME TERROR OF THE SEAS

Above, submarine *S 51* of the United States navy, with its entire crew of thirty-seven men on deck. In less than twenty-four hours thereafter, it was rammed by the steamship *City of Rome*, and all but four of the crew were drowned. The disaster occurred in September, 1925. Below, the submarine *V 2*, the largest vessel of its class in the American navy. The craft is 341 feet in length, and has a speed on the surface of the sea of twenty-one knots (24.18 land miles per hour).

The first submarine to be used in war was built by a colonial, David Bushnell, during the American Revolutionary War. Bushnell's craft, like Van Drebbel's, was propelled by oars. He called it the *Turtle*. This boat was submerged and brought under the hull of a British ship in New York Harbor, but the operator found it impossible to drill through the ship's bottom, and had to abandon his craft.

Robert Fulton, inventor of the steamboat, constructed the first cigar-shaped submarine while he was living in France, and gave successful exhibitions in the harbor of Brest, afterward taking his invention to England. This submarine was known as the *Nautilus*—a name borrowed by Jules Verne for Captain Nemo's ship. The *Nautilus* stayed under water for about five hours and blew up an old hulk with a mine; nevertheless, its inventor received no encouragement, and turned his attention to the steamboat.

During the War of Secession, the Confederates built several small submarines known as *Dauids*, with which they succeeded in

wrecking the *Housatonic*, a Federal ship anchored in the harbor of Charleston; but at the same time, the submarine was itself destroyed and was found some years later, having been caught in the hole torn by the torpedo which it had fired. The *Dauids* sent six crews to the bottom of the sea. They were about sixty feet long and were manned by nine men, eight of whom propelled them by working a screw shaft by hand, while the ninth steered.

In developing the practicable submarine of the present, the American and French nations took the lead. Two early French submarines which proved capable of service were the *Gymnote* and the *Goubet*. They were tested at Toulon and Cherbourg in 1888, and were maneuvered with considerable ease. The *Goubet* had a displacement of two tons. It was equipped with an electric motor and a storage battery; air was furnished from reservoirs, as in the latest type. The type of craft which has been developed by the principal nations was the invention of John P. Holland, in 1877.

The submarine was the most important and the most dreaded weapon directed against the



SEARCHING FOR MINES IN A MINE FIELD

Entente Allies in the World War. In the winter of 1916-1917, the Germans proclaimed it their chief reliance in the effort to secure victory. The story of this submarine struggle is told in the article **WORLD WAR**.

SUBMARINE CABLE. See **CABLE**, **SUBMARINE**.

SUBMARINE MINE, an unseen weapon of destruction against which the mightiest battleship is helpless, a hidden menace more dreaded by naval men than any gunfire or attack by overwhelming visible forces. Great ingenuity has been used in the preparation of mines which may, in an instant, turn the most peaceful harbor or the smoothest seas into a scene of disaster. It was not until the War of Secession that submarine mines were regarded as dangerous, or even practicable; but during that struggle they acquired such a record for destructiveness that it became apparent they must play an important part in wars of the future.

Modern submarine mines are of three kinds—observation, electro-contact, and automatic. Not only are these mines, when laid, of terribly destructive power, but the very placing of them in the sea or inland waters is attended by considerable danger.

Observation Mines. As the name implies, these mines are placed in waters where they may be controlled from the shore. They may be arranged singly, in groups, or in line across the openings into harbors. This type of mine has a casing of steel, is buoyant, and is loaded with from 200 to 500 pounds of wet guncotton. It is destructive within a radius of thirty feet, when exploded below the surface. Observation mines may be exploded from the shore merely by the switching on of an electric current.

Electro-Contact Mines. These mines are made of either iron or steel, and contain a charge of seventy-five pounds of guncotton, which is sufficient to destroy the biggest ship afloat. They lie nearer the surface than obser-

vation mines, as they are intended to explode when actually in contact with the hull of a vessel. Running through the explosive charge is an electric wire called the firing circuit.



SUBMARINE MINES

They may rest fastened to the sea bottom or may be arranged to float at any distance from the surface.

The electric current is supplied from a shore battery, and all that is needed to make these mines harmless is to turn off the current.

Automatic Mines. These are the most dangerous to handle, as they contain within them-

selves all that is necessary for explosion, and do not depend on an electric spark flashed from the shore. The firing battery is in the shell itself. In appearance and construction, these mines are similar to the other two varieties, and are either spherical or cylindrical in shape. They are absolutely beyond control when once laid, and a fishing boat is as liable to destruction as a warship. Friend and foe are equally in danger, unless the exact location is known; when anchored by weights, they are carefully charted for the benefit of friendly and neutral shipping. Automatic mines, when scattered indiscriminately over the sea, are called *floating mines*. Drifting according to wind, tide, and currents, they are a menace to all shipping.

Mine-Laying. The proper placing and laying of mines is a complicated operation. Mines cannot be dropped haphazard into the sea. The position must be carefully studied, and the depth beneath the surface accurately calculated, as also must be the localities where the effect will be greatest. In mines to be exploded by electric current from the shore, the laying of cables and the anchoring of mines require great care.

Searching for Mines. The accompanying illustration clearly shows the principal method of searching the sea for suspected mines. The work involves great difficulty and danger, as the mines can be located only after the vessels have successfully passed over the zone of danger. The two vessels are connected by a heavily weighted cable, which they drag between them. Mines thus caught are destroyed. If an electrical cable is caught in the net, it is at once cut, rendering all mines connected with that cable ineffective. Areas of mined waters may be rendered safe also by countermining; that is, by exploding mines in the suspected area.

Following the success of the explosive paravane in attacking submarines (which see), a protective paravane was developed to guard vessels against mines. It consists of a buoyant, torpedo-shaped instrument, towed from either side of a ship, submerged at a definite depth, and kept at a required distance from the sides of the vessel. Instead of being loaded with an explosive, the protective paravanes are provided with cutters, and as the tow cable catches the mooring wire of a mine, it slides it along to the paravane, which cuts the wire, causing the mine to come to the surface, where it may be destroyed by gun fire. Paravanes were used extensively during the World War, and not only saved many vessels, but also discovered and destroyed many mine beds that were uncharted.

In the World War. Numerous warships, destroyers, passenger steamers, and other vessels were destroyed by mines during the war. These instruments of destruction were

laid principally in the North Sea, the English Channel, and the Mediterranean Sea, where they proved a deadly menace to shipping. The Germans were especially active in mining operations in the North Sea, and their mine-layers had numerous fights with British fighting craft. The Germans also built a special type of submarine for mine-planting. One such submarine, captured by the British, carried sixteen mines.

SUBPOENA, *sub pe' na*. If an officer of a court of law or other person serves upon you a written notice to appear and give testimony in a case in court, you must obey the command or be liable for contempt of court (see **CONTEMPT**). The name applied to such a notice is *subpoena*, which is Latin for *under penalty*. If it is a *subpoena duces tecum* (bring with you under penalty), it contains a clause demanding that you bring to court certain papers, books, or other exhibits. See **WITNESS**.

SUBSIDY, *sub' sîh dih*. When the Union Pacific Railroad was built, it was known that for many years it could not hope to pay expenses, for its route was through as yet unsettled territory; however, the road was needed to induce Western settlement, so the United States granted the railway corporation tracts of public land located along its line, as a partial reimbursement for the vast sum of money expended in building. Since then, other great pioneering railroads have received like important assistance. Aid of this nature, extended by a national, state, or city government to some private enterprise, for the purpose of helping it become established on a firm financial basis, is a *subsidy*, and the corporation or firm receiving the aid is said to be *subsidized*. Premiums or bounties on exports, and bounties paid for killing animals, are a form of subsidy (see **BOUNTY**).

The wrong use of this sort of aid has led many to believe that any subsidy is bad in principle; on the contrary, in such instances as that of the Union Pacific Railroad, it is a necessity, and is granted because the government believes that the benefit derived from the enterprise will be greater than its cost to the state. Merchant marines are often built up by the granting of ship subsidies. Before the World War, Germany gave \$800,000 a year to the Hamburg-American Line for the partial maintenance at sea of the great *Vaterland*, the *Imperator*, and other passenger vessels that could not be made self-sustaining. This general policy built up a great merchant fleet for the German Empire. In the American Congress, numerous efforts have been made to provide for subsidies to shipping companies, to revive the United States merchant marine, but subsidies as such have never been granted. However, financial assistance is now granted by means of mail contracts and long-term

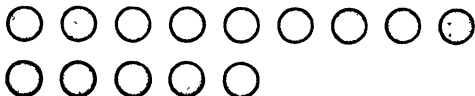
loans with low interest rates. See **MERCHANT MARINE**.

SUBTRACTION, the process of finding the difference between two numbers, or of taking one number out of another. The number subtracted is called the *subtrahend*. The number out of which the subtrahend is taken is called the *minuend*. The result is called the *remainder*, or *difference*.

Teaching of Subtraction. Addition and subtraction go hand in hand, but the latter is more difficult of mastery, because it is "association backward," while addition is "association forward." The mind readily turns the new problem of subtraction into the more familiar one of addition. One well-known author on the subject speaks of this translation of subtraction into addition as "having the advantage of using only one table for addition and subtraction, and of saving much time in operation." Another refers to it as "primitive, barbarous, awkward, and time-destroying."

1. Sarah has 9 pennies and Tom has 5 pennies. How many more has Sarah than Tom?

Sarah has 4 more.



How many pennies must Tom get to have as many as Sarah? He must get 4.

In both the foregoing cases, we see that the difference between 5 and 9 is 4, and that 4 must be added to 5 to get 9. In addition, we say it in this way: $5+n=9$. When we have the answer, we say $5+4=9$. In subtraction, we say $9-5=n$, and, having the answer, we say $9-5=4$.

Addition	Subtraction
$8+n=12$	$12-8=n$
$8+4=12$	$12-8=4$
$9+n=16$	$16-9=n$
$9+7=16$	$16-9=7$

In addition, we say, "What number added to 8 gives 12?" In subtraction, we say, "8 taken out of or 'away from' 12 leaves what?" Those who would always look at the problem from the viewpoint of addition follow the well-known "Austrian Method" of subtraction.

2. Sarah had 9 pennies, and gave 5 to Tom.
How many pennies has she left?

Here we clearly have the problem, $9 - 5 = ?$; or, "When 5 is taken out of 9, how many are left?" This is not the problem of the difference between 9 and 5, like problem 1, and it is seen as in Fig. 2.

Concrete Work. As in addition (see ADDITION), much *concrete* work should be done in building up groups and taking them apart to

make subtraction clear; for example, a group of 12 pennies may be separated in various ways: $12=5+7$, $12-5=7$, $12-7=5$. This *formal* way of writing it must be introduced



slowly and carefully, with much *oral* work preceding it and accompanying it. Below are suggestions for concrete material:

1. Groups of pennies, nickels, dimes.
2. Groups of inch cubes, or cardboard squares.
3. Compare various objects as to length, width, and height by measuring with foot rule or yard rule.
4. Compare heights of children.
5. How much farther can John jump than Dan? Measure in inches and subtract.
6. Compare weights of articles.
7. Compare costs of various articles, using money.

8. Have foot rule, yard rule, scales, money, pennies, nickels, dimes, dollars (real money), cubic blocks, etc.

Home Help. At home, mother or father may do much to help at this point, for the freedom of movement and variety of material, and opportunity for measuring and grouping and thus getting material for comparison by subtraction, are much greater at home than in the ordinary schoolroom. (For further suggestion as to home help, see ADDITION.)

Subtraction Combinations. The following table presents the subtraction combinations of the numbers with differences of 9 or less. These should be used for drill, in accordance with the methods suggested in the section immediately following the table.

1.	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
2.	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
3.	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
4.	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>
5.	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>
6.	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>
7.	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>
8.	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>

9.	8	9	10	11	12	13	14	15	16	17
	8	8	8	8	8	8	8	8	8	8

10.	9	10	11	12	13	14	15	16	17	18
	9	9	9	9	9	9	9	9	9	9

Suggestions for Rapid Work. 1. Cards like the illustration may be held up before the class by the teacher for an instant, and the children may write each answer. When a number of cards have been shown in this way, the answers may be given, and each child may know where he has made an error. In checking in this way, the teacher finds which combinations give greatest difficulty. The class may take sides in this, seeing which side has the greater number correct. This may be done orally as a rival game, or just as a quick review.

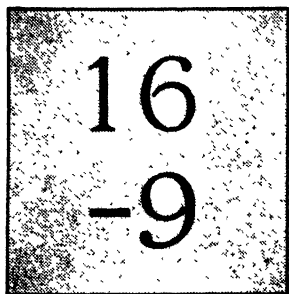


FIG. 3

2.	11	21	31	41
	-3	-3	-3	-3

	12	22	32	42
	-7	-7	-7	-7

A set of cards like the above may be passed to the class and exchanged among the children; the answers may be given orally, or written on the blackboard or on paper, but not on the card. Thus the same cards may serve many classes.

12	29
8	18
9	15
11	17
13 -5	9 -9
15 -6	-8
6	-7
7	
14	
24	

Placing lists of this kind upon the blackboard gives opportunity for comprehensive review, and for repeated review of any difficult subtraction. The lists may be long or short, and the subtrahend may be changed many times.

4.	8	9	7	5	6	4	6
	-8	-9	-7	-5	-6	-4	-6
	15	9	3	9	7	9	0

The problems are on the blackboard; the child goes quickly to the board, erases 8, and puts the minuend number in its place.

5.	12	16	13	23	12	12
	-8	-8	-8	-8	-8	-8
	7	7	4	14	9	5

The child goes to the board, erases 8, and puts the subtrahend number in its place.

6. Under ADDITION many suggestions will be found that may be changed to serve the purpose of the teacher in subtraction (see ADDITION).

Subtraction of Numbers of Two or More Digits. (a) Use dimes and pennies, and the first step is very simple. The child has 2 dimes and 7 pennies. He spends 9 pennies. What has he left?

dimes	pennies	=	dimes	pennies
2	7		1	17
	-9			-9
				8

Have a stack of pennies, so that he may change his dime for pennies.

$$(b) \quad \begin{array}{r} 27 \\ -9 \\ \hline 10 + 17 \\ -9 \\ \hline 10 + 8 = 18 \end{array}$$

$$(c) \quad \begin{array}{r} 14 \\ +8 \\ \hline 22 \\ -10 \\ \hline 12 \end{array} = \begin{array}{r} 22 \\ -8 \\ \hline 14 \end{array} = \begin{array}{r} 10 + 12 \\ -8 \\ \hline 10 + 4 \end{array}$$

$$\begin{array}{r} 48 \\ +5 \\ \hline 53 \\ -13 \\ \hline 40 \end{array} = \begin{array}{r} 53 \\ -5 \\ \hline 48 \end{array} = \begin{array}{r} 40 + 13 \\ -5 \\ \hline 40 + 8 \end{array}$$

In the foregoing additions, we understand how 12 is made by 4 and 8, and how 13 is made by 5 and 8, and see that, when we come to subtract, we must think of 22 as 10 + 12, and 53 as 40 + 13 (see ADDITION).

$$\begin{array}{r} 65 = 50 + 15 \\ -49 = 40 + 9 \\ \hline 16 = 10 + 6 \\ 91 = 80 + 11 \\ -48 = 40 + 8 \\ \hline 43 = 40 + 3 \end{array}$$

Explanation: The subtraction is done beginning at the right: 9 from 15, 6; 40 from 50, 10. Then the sum of 10 and 6 is written to the left.

$$(d) \quad \begin{array}{r} 193 = 100 + 80 + 13 \\ -147 = 100 + 40 + 7 \\ \hline 46 = 40 + 6 \end{array}$$

$$\begin{array}{r} 243 = 200 + 30 + 13 = 100 + 130 + 13 \\ -198 = 100 + 90 + 8 = 100 + 90 + 8 \\ \hline 45 = 40 + 5 \end{array}$$

(e) In time the writing out in full may be dropped and the separation done mentally, as follows:

$$\begin{array}{r} 243 \\ -198 \\ \hline 45 \end{array}$$

Explanation: Take 10 from 40 or 1 ten from 4 tens and add it to 3, which gives 13. 8 from 13 leaves 5. Take 100 from 200 and add it to 30, making 130, or take 100, which is 10 tens, and add it to 3 tens, making 13 tens. 9 tens from 13 tens leaves 4 tens, or 40. The result is 45. This can be seen very clearly with dollars, dimes, and pennies.

Steps in Learning Subtraction. The following summary of the successive processes in learning subtraction may be found helpful:

1. Finding the missing number:

$$5 + n = 10; \quad 4 + n = 8; \quad \begin{array}{r} 6 \\ n \\ 8 \end{array} \quad \begin{array}{r} 4 \\ n \\ 9 \end{array}$$

2. The same fact in a different form; find the difference:

$$\begin{array}{r} 4 \\ 3 \\ n \end{array} \quad \begin{array}{r} 5 \\ 2 \\ n \end{array} \quad \begin{array}{r} 7 \\ 5 \\ n \end{array} \quad \begin{array}{r} 6 \\ 3 \\ n \end{array} \quad \begin{array}{r} 9 \\ 4 \\ n \end{array} \quad \begin{array}{r} 8 \\ 4 \\ n \end{array}$$

3. Making change for amounts less than 10.

4. Writing subtraction with the minus sign:

$$8 - 5 = 3; \quad 6 - 3 = 3; \quad 7 - 5 = 2$$

5. The subtraction combinations. (See earlier section.)

6. Subtracting two-figure numbers:

$$\begin{array}{r} 44 \\ 24 \end{array} \quad \begin{array}{r} 67 \\ 43 \end{array} \quad \begin{array}{r} 54 \\ 32 \end{array} \quad \begin{array}{r} 79 \\ 20 \end{array} \quad \begin{array}{r} 87 \\ 55 \end{array} \quad \begin{array}{r} 60 \\ 50 \end{array}$$

7. Subtracting with borrowing or carrying:

$$\begin{array}{r} 13 \\ 6 \end{array} \quad \begin{array}{r} 14 \\ 32 \end{array} \quad \begin{array}{r} 51 \\ 14 \end{array} \quad \begin{array}{r} 73 \\ 48 \end{array} \quad \begin{array}{r} 87 \\ 48 \end{array} \quad \begin{array}{r} 92 \\ 37 \end{array}$$

8. Subtracting three-figure numbers:

$$\begin{array}{r} 452 \\ 231 \end{array} \quad \begin{array}{r} 565 \\ 138 \end{array} \quad \begin{array}{r} 653 \\ 202 \end{array} \quad \begin{array}{r} 535 \\ 157 \end{array} \quad \begin{array}{r} 736 \\ 248 \end{array} \quad \begin{array}{r} 842 \\ 356 \end{array}$$

9. Zeros in subtraction:

$$\begin{array}{r} 280 \\ 162 \end{array} \quad \begin{array}{r} 300 \\ 153 \end{array} \quad \begin{array}{r} 450 \\ 72 \end{array} \quad \begin{array}{r} 518 \\ 200 \end{array} \quad \begin{array}{r} 601 \\ 36 \end{array} \quad \begin{array}{r} 302 \\ 81 \end{array}$$

Other Methods. There are other methods of subtraction in common use, but the above is explained most easily to the young mind. The Austrian Method sees subtraction as addition:

$$\begin{array}{r} 657 \\ - 398 \\ \hline 259 \end{array}$$

Explanation: 8 and 9, 17; 10 and 5, 15; 4 and 2, 6. The minuend is held in mind as the sum of two numbers, and the subtrahend as one of these numbers. As the other number is found in each column, it is placed in the answer.

Another method:

$$\begin{array}{r} 657 \\ - 398 \\ \hline 259 \end{array}$$

Explanation: 8 from 17, 9; 10 from 15, 5; 4 from 6, 2. 10 is added to the minuend to

make 7, 17. To equalize matters, 1 ten is added to 9 tens in the subtrahend. 10 tens are added to 5 tens in the minuend, and again to equalize matters, 100 (which is equal to 10 tens) is added to the subtrahend. It is seen clearly in the following form:

$$\begin{array}{r} 657 = 600 + 50 + 7 \\ - 398 = 300 + 90 + 8 \end{array}$$

It becomes for easy subtraction:

$$\begin{array}{r} 600 + 150 + 17 \\ 400 + 100 + 8 \\ \hline 200 + 50 + 9 = 259 \end{array}$$

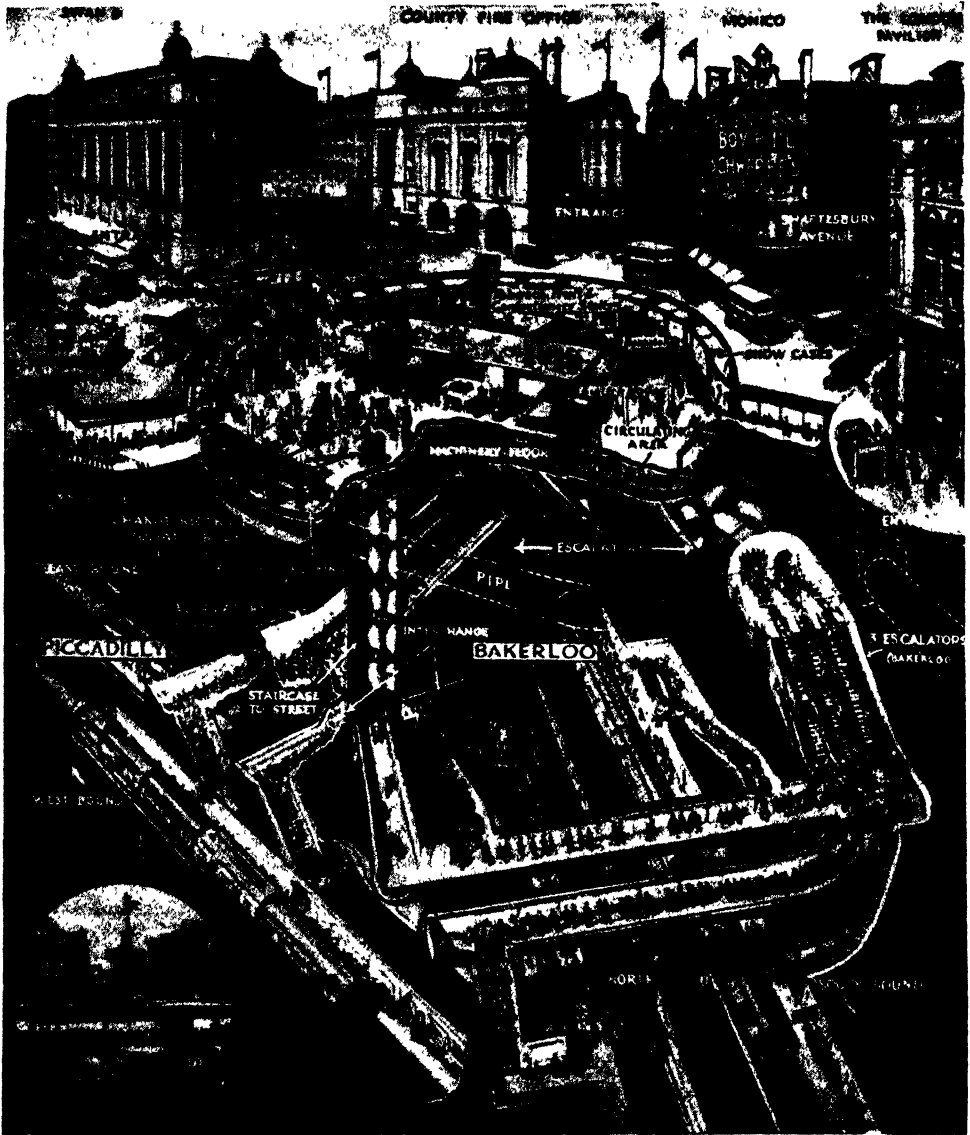
110 has been added to both minuend and subtrahend. This method is in common use among adult people, and is less strain upon the mind than the first method presented. But it should not take the place of that method with young children, because of the difficulty to the child mind of understanding it. It is easily adopted later. It is highly desirable that beginning students adopt a single method, and use it until the process becomes automatic.

Place Value. Read in connection with subtraction the articles ADDITION and NOTATION, where *place value* is discussed. E.U.G.

SUBWAY, OR UNDERGROUND RAILWAY, a tunnel or system of tunnels constructed for the purpose of placing a railroad beneath the level of the street. Such systems are coming more and more into use, and in some cities, especially New York, London, and Paris, they form a vast network of underground railways. London was the first city to adopt subways, and now has five systems affording quick and economic transportation to all parts of the city and suburbs. Some of London's subways, there known as "tubes," are so far underground that elevators are provided by which passengers may descend to them. A subway destined to grow to large proportions was opened in Buenos Aires in 1913; in 1924 Barcelona opened its first subway; and in 1926 one was opened in the city of Sydney, Australia.

In the United States, subways have been constructed only in New York, Boston, Philadelphia, and Chicago. The New York subways form the largest underground-railway system in the world, and perhaps present the best example of passenger-subway construction. Chicago's subways as yet are for freight alone, and are nearly seventy miles long, under the central business district. The city still relies on its street railways, suburban steam and electric roads, elevated railways, and hundreds of motorbuses to provide passenger service, though, for a generation, the city has realized a need of underground service.

The first metropolitan subway built in London was operated by steam locomotives, and was opened in 1863. The first deep-level "tube" was opened in 1890, with electric locomotives.



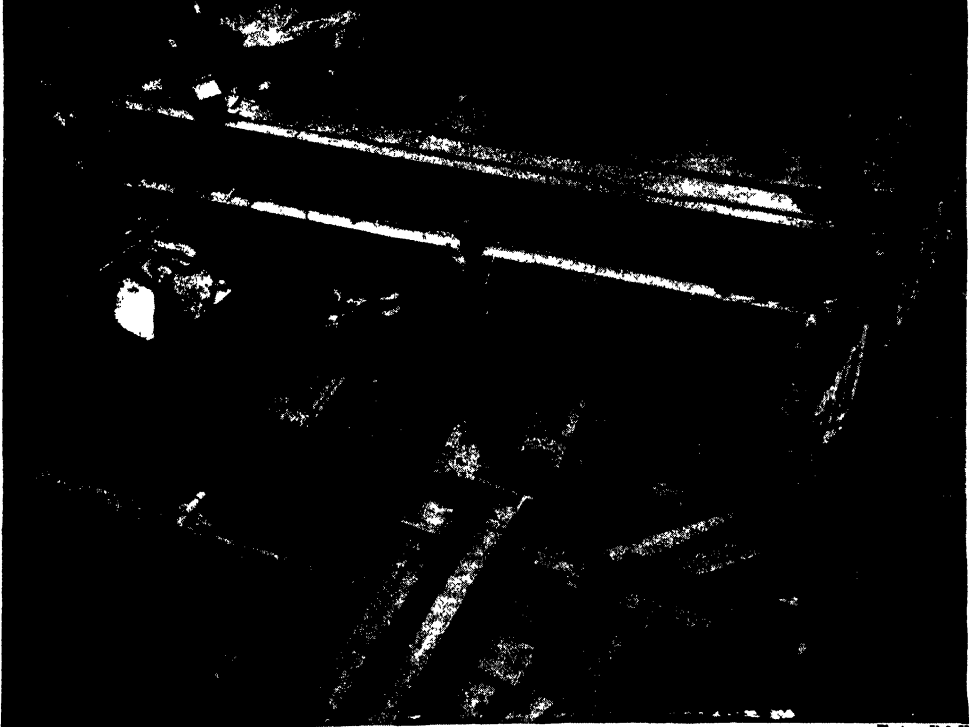
A SECTION OF LONDON'S UNDERGROUND RAILWAY

Photo: Keystone

Declared to be the finest and most intricate system in the world. The illustration shows the center of the system, beneath Piccadilly Circus.

All subsequent subways have been operated by electricity. The cost of construction is very high; the New York system required an outlay of an average of \$2,000,000 to \$3,000,000 per mile, because the excavations provided for four tracks. So extensive is the subway system of New York and its suburbs that one may travel from the New Jersey shore, under the great city, and beneath two rivers into Long Island, without once seeing daylight. See NEW YORK CITY (Subways and Tunnels).

Subway Construction. In building a subway, one of two plans may be followed. When the opening is to be large, as in New York, the "open cut" is employed. The subways there are under the streets, and occupy all the subterranean space from curb to curb. First, the street paving is removed, and then workmen remove all soil and rock until the street level is twenty-five or more feet below the sidewalk line. At this depth, tracks are laid, stations are built, sidewalks are constructed, and



Photos: U & U

Subway Building in an American City. Above, the process of excavation in a New York street. Below, an excavation to the full depth of eighty-five feet below street level for a crosstown subway in New York.

then the great opening is again covered at the street level, and street paving follows. If one line crosses another, one road bed must be placed at a much greater depth, for one line must pass under the other.

The second form of subway, designed for one or two tracks, may be constructed by boring into the solid earth at the desired depth, without disturbing the surface above; the top and sides of the bore are protected by walls of steel or timber, during these operations. Such bores are usually circular, or nearly so, while a cross section of greater tubes, like the subways in New York City, presents a rectangular form. A cross section of a London "tube" is a semicircle.

Related Subjects. The reader is referred in these volumes to the article *TUNNEL*, and the additional references there named.

SUCAT, the British name of Saint Patrick. See *PATRICK, SAINT*.

SUCCESSION, *suk sesh' un*, **WARS**, those wars that were caused by rival claims to the inheritance of a throne. Four important conflicts in modern European history are known by this name: the War of the Spanish Succession, the War of the Polish Succession, the War of the Austrian Succession, and the War of the Bavarian Succession.

The War of the Spanish Succession. This struggle began in 1701 and lasted until 1714. Its American phase was known as Queen Anne's War.

Charles II, king of Spain, was childless, and the question as to who would be his successor was of vital importance to Europe. Family alliances among related sovereigns were very common in those days, and if a foreign-born prince ascended the throne of Spain as nearest heir, which seemed inevitable, an entirely new alignment of the European powers was apt to be the result. The laws governing the succession were so involved, and the claims of the different heirs were so conflicting, that it is almost impossible to know who rightfully should have worn the Spanish crown. The valid claims soon were narrowed down to three heirs: the French prince Philip, Duke of Anjou and grandson of Louis XIV; Joseph Ferdinand, the young electoral prince of Bavaria; and the Archduke Charles of Austria, son of Emperor Leopold I.

The leading powers of Europe joined in a treaty in 1698, according to which Joseph Ferdinand was to become king of Spain, and France and Austria were to be compensated with territories from the extensive Spanish possessions in Italy and other parts of Europe. Unfortunately, the electoral prince died, and the matter was unsettled again. A second treaty, in 1699, arranged that the Archduke Charles was to receive the Spanish crown, and

the French royal family would be indemnified by additional Spanish territory. Everything seemed to be arranged in order to guarantee the peace of Europe, when King Charles II died in Spain on November 1, 1700, leaving a will by which he bequeathed the crown to the French prince, Philip of Anjou. Louis XIV then broke his solemn word, given when he signed the treaty, proclaimed his grandson to be king of Spain and declared that the Pyrenees were no more. All Europe stood aghast at the prospect of the virtual annexation of the Spanish empire to the preponderant power of France, and Louis further angered the English by recognizing the son of the de-throned James II as the rightful king of England.

Almost immediately, the Grand Alliance was formed between England, the Holy Roman Empire, the Netherlands, Prussia, and Hesse, in order to prevent Philip of Anjou from becoming king of Spain, and to aid the Archduke Charles to ascend that throne in his place. The allied forces were placed under the command of two great generals, the English Duke of Marlborough and Prince Eugene of Savoy, under whose leadership the French were defeated decisively, during the years 1704 to 1709, in the battles of Blenheim, Ramillies, Oudenarde, and Malplaquet. The fighting was for the most part in Germany and the Netherlands, although there were several campaigns in Spain. These ended with the establishment of Philip as king, and the extension of his rule over most of Spain.

The allies possibly might have overthrown Louis XIV and seized Paris had not dissensions broken out among them; in addition, party politics in England caused the Tory government of that country to desire peace in order to discredit the victorious Marlborough, who was a prominent Whig. Louis XIV, although badly defeated and with his country exhausted, took heart, and by skilful diplomacy brought about the Peace of Utrecht in 1713, by which he obtained fairly favorable terms, including the recognition of his grandson as king of Spain. France and Spain never were united, however. The emperor refused to sign the Treaty of Utrecht and did not make peace until a year later, when he found it necessary to give way and sign the Treaty of Rastatt, upon almost the identical terms of the Peace of Utrecht.

The War of the Polish Succession, fought during the years 1733 to 1735, was caused by the election by Polish nobles of Stanislaus Leszczyńska, father-in-law of Louis XV of France, as king of Poland. Russia and Saxony forced the Poles to accept the Elector Augustus of Saxony as king, and war followed. France failed to keep Stanislaus on the Polish throne, but he was given the duchy of Lorraine, which

reverted to the French crown at his death in 1766. Although France ultimately gained this territorial accession, its prestige received a damaging blow.

The War of the Austrian Succession was known in America as King George's War. The struggle began in 1740 and lasted until 1748. It was caused by the death, in the former year, of Emperor Charles VI, who left as heirress to his dominions a daughter, the famous Maria Theresa. The great powers of Europe had guaranteed her succession to the Austrian dominions, by the Pragmatic Sanction, but they broke their pledged word and attempted to despoil the young princess of her inheritance.

The first to attack Maria Theresa was Frederick the Great, king of Prussia, who conquered the province of Silesia. During the next year, 1741, he strengthened his hold upon the territory by an overwhelming victory at Mollwitz. France and Spain and the two strong German states of Bavaria and Saxony joined Prussia, and for a time Maria Theresa was threatened with the loss of her dominions. The Elector Charles of Bavaria was chosen emperor by support of the allies, and the Hapsburg family, for the first time in 300 years, failed to hold the throne of the Holy Roman Empire.

However, Maria Theresa saved her crown and most of her dominions by her own indomitable courage and vigorous leadership. She appealed to the Hungarians to defend her, their queen, and also roused the other people of her varied dominions to her support. Furthermore, she was aided by an alliance with the great maritime powers, England and Holland, which crushed the power of France at sea. Maria Theresa soon drove out the new emperor, Charles VII, even from his Bavarian dominions, and he died in 1745. She then received the title of empress through the election of her husband, Francis of Lorraine, as Emperor Francis I.

Maria Theresa, after making two separate treaties of peace with Frederick the Great, finally separated this most dangerous antagonist from the alliance with her other enemies, but accomplished it only at the price of the cession to him of Silesia. Also, with the aid of the armies of her English and Dutch allies, she carried on the war against France and Spain with great vigor and success. However, her successful career was checked by the brilliant victories of the French army in the Austrian Netherlands, under the command of the German-born Marshal Saxe, and as her dominions, with the exception of Silesia, were safe under her control, she was induced by the more peaceful attitude of her allies, England and Holland, to agree to make peace.

The Treaty of Aix-la-Chapelle, which was signed in 1748, finally ended the war. Maria Theresa, however, refused to consider that she

had lost Silesia beyond recovery. The empress at once began the negotiations that led to the realignment of the European powers, and to her final attempt to destroy Frederick the Great and regain Silesia, through a later conflict that was to be known as the Seven Years' War.

The War of the Bavarian Succession was a short quarrel, during the years 1778 and 1779, over the succession to the throne of Bavaria and the disposition of part of the Bavarian territory. The dispute was between Prussia and Austria. The Elector Maximilian Joseph died in 1777, leaving no direct heirs. Austria then attempted to dominate the affairs of Bavaria and to dictate the succession, thus arousing the jealousy of the ever-watchful king of Prussia, Frederick the Great. Both Prussia and Austria invaded Bavaria with their armies, and a bloody war seemed inevitable, but no battle was fought, and the dispute finally was compromised. Neither country was anxious for war, and France and Russia used their good offices to mediate and secure peace. The Treaty of Teschen was signed in 1779, and both Austria and Prussia were satisfied by certain territorial gains. This war was not of very great historical importance, except for the fact that, by accepting the mediation of Russia, the powers recognized that country as a member of the family of European nations, and its influence increased from that time. E.D.F.

Related Subjects. For other details as to the Succession Wars, the reader is referred in these volumes to the following articles:

Aix-la-Chapelle, Treaties of
Blenheim
Charles (VI, Holy Roman
Empire)
Frederick (II, Prussia)
French and Indian Wars
(Queen Anne's War and
King George's War)

Louis (XIV, France)
Maria Theresa
Marlborough,
Duke of
Seven Years' War
Spain (Government
and History)
Utrecht, Peace of

SUCCORY, *suk' o ri*. See CHICORY.

SUCKER, the name given to several kinds of fish closely related to the catfish family, which have mouths with thick, fleshy lips.



THE SUCKER

There are several species, all of moderate size, and all, except one Siberian group, natives of North America. They are dull-colored except in spring, when the males have rose or orange markings. Suckers are found in rivers, lakes,

bayous, and mill ponds, where they obtain their food by sucking up mud and soft organisms from the bottom. They are of little value, because their flesh is soft and tasteless. Suckers are placed by zoölogists in the genus *Catostomus*. L.H.



Photo: O R O C

A NATIVE OF THE SUDAN, IN FULL DRESS

SUCKER STATE, a popular name applied to Illinois (which see).

SUCKLING, SIR JOHN (1609-1642), an English lyrical poet of the metaphysical group, born at Whitton, Middlesex, and educated at Cambridge. He fought under Gustavus Adolphus, amused and startled London with his wit, bravado, and spendthrift habits, and spent immense sums of money for Charles I in the conflict with Cromwell. Accused of taking part in the plot to release Strafford (which see) from the Tower, he fled to the Continent. Facts about his later life are obscure, but it is believed that he finally returned to Paris, and there poisoned himself.

His Best-Known Poems. His *Why So Pale and Wan, Fond Lover*; *A Ballad Upon a Wedding*; and *I Prithee Send Me Back My Heart* are famous.

SUCRE, *soo' kray*. See BOLIVIA (The Cities).

SUCRE, a standard coin in Ecuador. See MONEY (Foreign Monetary Standards).

SUCROSE, *su' krohs*. See BIOCHEMISTRY (Substances in Animals and Plants).

SUDAN, *soo dahn'*, formerly spelled SOUDAN, a general term applied to a region of Central Africa, extending roughly from the Sahara Desert on the north to Belgian Congo on the south, and from the former French Senegambia and Niger, on the west, to Egypt. The region is inhabited by negro and Arab tribes, but is controlled by Great Britain and France; the extreme western section is under French influence, and the eastern section, or Anglo-Egyptian Sudan, is governed by the British. In these volumes the vast Sudanese area is described under the titles ANGLO-EGYPTIAN SUDAN and FRENCH SUDAN.

SUDAN GRASS, a hay plant introduced into the United States in 1909 from Khartum, Sudan, by the Federal Department of Agriculture. First tested in Texas, it gave such excellent results that thousands of acres were planted in the South and Southwest, both in humid and in irrigated sections. Eventually, it spread to nearly all parts of the country. Sudan grass has a fibrous root system, and is grown from seed which must be planted every year, as it is an annual. As it has no perpetual rootstock, there is no danger of its becoming a weed and a pest. The grass is cultivated both as a forage plant and for its seed. Sudan hay has a higher feeding value than timothy, and is liked by stock, especially hogs. It is one of the best drought-resisting plants known to American farmers, and can be grown on almost any kind of soil, but does not do well in high altitudes. Two cuttings of hay a year can be obtained in semi-arid regions, and three in humid sections. The first crop matures in from sixty to eighty days. B.M.D.

Classification. Sudan grass is closely related to sorghum (which see). It is classed as *Andropogon sorghum sudanensis*, in the grass family, *Gramineae*.

SUDERMANN, *zoo' dur mahn*, HERMANN (1857-1928), a dramatist and novelist, born at Matzicken, Prussia. He was educated in the public schools of Elbing and Tilsit, and in the University of Königsberg, Prussia, where he made a close study of history, literature, and philosophy. For a short time, he was a private teacher in Berlin, but in 1881 he became editor of a newspaper in that city, and three years later began to devote his entire time to writing plays and fiction.

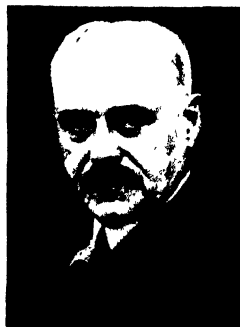


Photo: U & U

HERMANN SUDERMANN

The main ideas through all the work of Sudermann are the unnecessary strain, nervousness, and violence of modern civilization, the emptiness of many of the so-called moral rules handed down from previous generations, and the right of every human being to a happiness which shall not be hampered by artificial conventionality. He uses these theories over and over, often with gloom and bitterness, but never without absolute truthfulness. As an unsparing investigator of modern social life, he has few equals.

Sudermann's Works. His earlier novels, *Dame Care* and *Regina*, attracted very little attention, but in 1880 he sprang into national fame with his drama of German life, *Ehre*. Two gloomy but truthful tragedies, *The End of Sodom* and *Magda*, followed, dealing with the strained, artificial life of the modern city. The last-named play has been presented in nearly every great city in Europe and America, and Sarah Bernhardt and Eleanora Duse interpreted the principal rôle with great success. Among other dramas that have made an international impression should be mentioned *Moritur*, *The Fires of Saint John*, *The Joy of Living*, and *Stone upon Stone*. Sudermann's most powerful novel was *Es War*. The work of his later years lacked his original vigor, doubtless because the rapid changes and the new freedom of thought and living which followed the World War robbed him of his most effective themes.

In 1921 he published the drama *The German Fate*; this was followed by his autobiography and other writings, including *The Mad Professor*.

SUE, EUGÈNE [MARIE JOSEPH] (1804-1857), a French novelist, born in Paris, who will always be remembered for his outstanding book, *The Wandering Jew*. His father, who was a physician in Napoleon's army, left him a large fortune, and after some study of medicine in his native city, and practice of it in the French army, Sue settled in Paris, to devote his time to writing. He had been on the sea a great deal, both as a boy and as a physician, and used his knowledge of ocean animals and plants in such weird romances as *The Salamander* and *Kernock, the Pirate*. These books appeared during the days of the romantic movement in French literature.

They were followed by novels dealing with the mysterious and the supernatural, with occasionally a touch of socialism, which was then gaining favor. Among the most noted of these stories were *The Mysteries of Paris* and *The Wandering Jew*, which showed extraordinary imagination and ability to impress upon the reader the idea of the horrible and uncanny. The plots, however, are very loosely constructed, and the style is often careless. The latter defect has been corrected in translations.

SUEDE, swede. See **LEATHER**.

SUEZ, soo ez', EGYPT. See **EGYPT (Modern Cities)**.

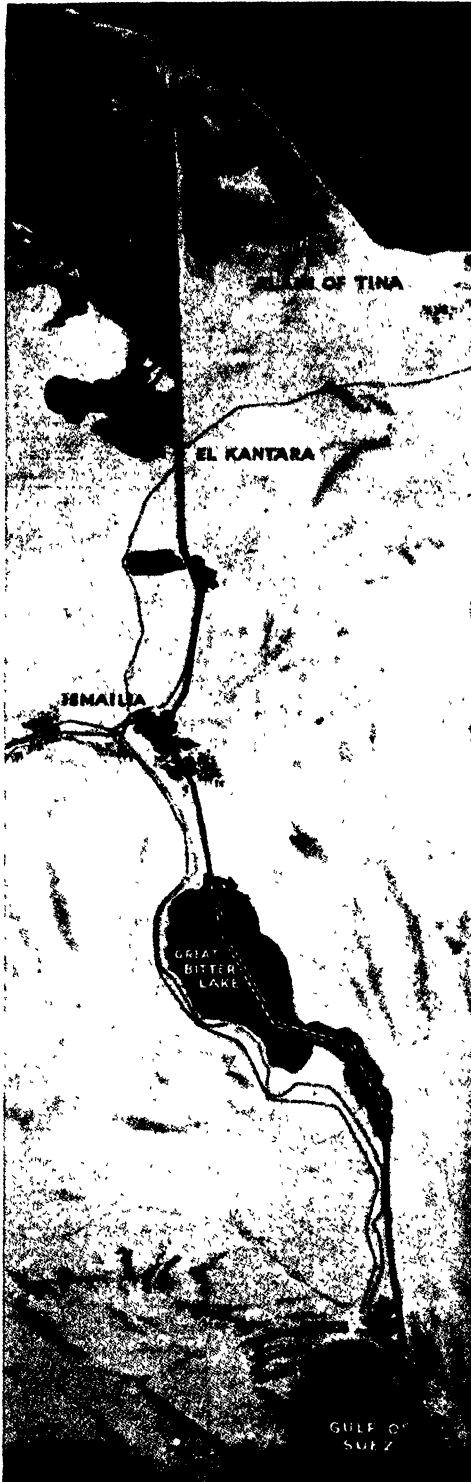
SUEZ CANAL, a ship canal extending in a north-and-south direction across the Isthmus

of Suez in Egypt, connecting the Mediterranean and Red seas. From Port Said, on the Mediterranean, it extends to Suez, on the Gulf of Suez, a distance of 103 miles, twenty-one miles of which consist of small lakes. Its construction, shortening the route between England and India by 6,000 miles, restored the Mediterranean to its ancient place as the most important highway of European and Asiatic trade.

The Suez Canal has no locks, because there is no important difference between the levels of the two connected seas. As it was originally built, it was twenty-six feet deep and seventy-two feet wide at the bottom. Because of the large increase in traffic since its construction, and the greater dimensions of modern vessels, the canal has twice been widened and deepened, and dredges are continually in operation to remove the sands, blown from the desert. In the beginning, the digging was done endirt with their spades and threw it over the banks; after 1865, machinery was used. The waterway was lighted by electricity in 1887, and after that time, only ships which were but before that time, only ships which were equipped with searchlights might pass through the canal at night. In 1886 the time required to go through the canal was about thirty-six hours; to-day, the trip can be made in less than half that time. The cost of construction of the canal, with improvements, was estimated at \$127,000,000, and though it is about twice the length of the Panama Canal, it cost only a third as much.

An important recent addition in the canal district was the establishment of the new city, Port Fuad, on the Asiatic side of the canal. It was built as a garden city, to provide homes for the many employees of the company, and to relieve the congestion at Port Said. Suitable homes are provided for all the many professions and classes represented in the personnel of so great a company.

History. There is evidence that a canal was built, connecting the Nile River and the Red Sea, many centuries before Christ, and the idea of joining the Red Sea and the Mediterranean may be traced to the eighth century A.D. Napoleon appreciated the advantages of a waterway across the Isthmus of Suez when he visited Egypt in 1789, and ordered surveys to be made. However, it was left to Ferdinand de Lesseps, a French diplomat and engineer, to carry out the scheme. Near the close of 1854, De Lesseps succeeded in obtaining permission from the viceroy of Egypt, and within the next five years worked to overcome various diplomatic, political, and economic obstacles which were set in his way. An International Consultative Commission met in 1855 to discuss the plans and decide the route, and by 1858 a company was organized with a capital



stock of about \$40,000,000, over half of which was subscribed in France, about one-fourth in the Ottoman Empire, and an almost negligible amount in other countries, the remainder being held by the viceroy of Egypt. The construction work was begun April 25, 1859, and ten years later, on November 9, 1869, the canal was opened for traffic, amid an elaborate ceremony attended by the emperor and empress of France, and presided over by the exultant, though irresponsible, Ismail I, khedive of Egypt.

England, whose large colonial possessions in Asia were brought thousands of miles closer by the Suez Canal, and which benefited most from its construction, had no part in its building, and bought none of the original shares. However, within six years after the grand opening, the prodigal khedive had sent his country into bankruptcy, and looked to his Suez Canal shares to supply him with ready money. Disraeli, Prime Minister of England, took advantage of this opportunity to gain a measure of control in the canal. The khedive's shares were purchased by the British government, and to-day Great Britain holds seven-sixteenths of them. The French government owns no shares, though it enjoys financial benefits through taxation of the company. The management of the Suez Canal is directed by an international committee, on which there are ten British members, twenty French, and one Dutch.

By an international convention, held in 1888, it was agreed that the canal should always be open on equal terms to the ships of all nations, both in peace and in war. Great Britain refused to sign the convention, and demanded certain concessions, because of its interests in Egypt. However, in 1904 that nation agreed to the original terms, including the provision that no special privileges, such as policing, fortifying, or preferential tolls, were to be allowed any one nation. In 1914 Great Britain ignored certain stipulations of the treaty of 1888, and put armed forces on both sides of the canal, allowing only the ships of neutral and allied powers to pass. In 1915 the Turkish army made an attack on Egypt, which was soon repulsed. The banks of the canal remained a British army camp until 1925, and monuments stand in Port Said, Ismailia, and Suez, as memorials of the World War. See LESSEPS, FERDINAND DE; CANAL.

SUFFRAGE, the right to vote, and thus, indirectly, to participate in the conduct of the affairs of a government. In states in which the government is representative, the people have the privilege of selecting certain persons to

ROUTE OF THE SUEZ CANAL

From the Mediterranean Sea, at the north, southward to the Gulf of Suez, an arm of the Red Sea.

take care of the political and governmental affairs. From an early period, the men of civilized countries have considered it their right to take some part in the government by giving their consent in the way of a vote, whether it be orally, by a clash of shields, by means of colored balls or other objects, or by secret ballot. Like most privileges, suffrage has always been restricted, to a greater or less degree, by property qualifications, social status, religion, sex, race, education or understanding, moral character, taxes, residence, and age. Gradually, the less vital restrictions were dropped, the more liberal and enlightened states leading the way, and to-day, in the leading countries, the main qualifications have to do with citizenship, age, good character, and residence.

In the United States. During the early years of the United States, even with the broad principles contained in the Declaration of Independence, less than one-fourth of the men of the country were permitted to vote. There were religious and property qualifications and class distinctions. In colonial times, as the political organization became more complex, more elaborate restrictions were made, to insure that only those who were capable, intelligent, and interested in the welfare of the community should be allowed to vote. The prerequisites calculated to determine whether or not a man had these qualifications were often narrow and bigoted. Certificates of church membership were required at one time; Quakers were considered unfit for the suffrage in most of the colonies; Roman Catholics, Jews, and free negroes alike suffered disfranchisement. Property qualifications were almost universal; in some colonies, possession of real estate was required; in others a certain amount of personal property was sufficient; and another variation was evidence of paid taxes.

After the adoption of the Federal Constitution, which left the determination of suffrage qualifications to the states, religious restrictions rapidly disappeared, and even property tests were made less stringent. As the influence of the frontier and the democracy of the West began to be felt in the more conservative Eastern states, property qualifications began to disappear, and practically all male citizens over twenty-one years of age, who were able to satisfy certain residence requirements, were permitted to vote. Small tax qualifications remained in a few of the states.

After the War of Secession and the granting of citizenship to more than four million negroes, a new and difficult suffrage problem presented itself. The radical elements in the North, which believed that the Southern leaders should be punished for their part in the strug-

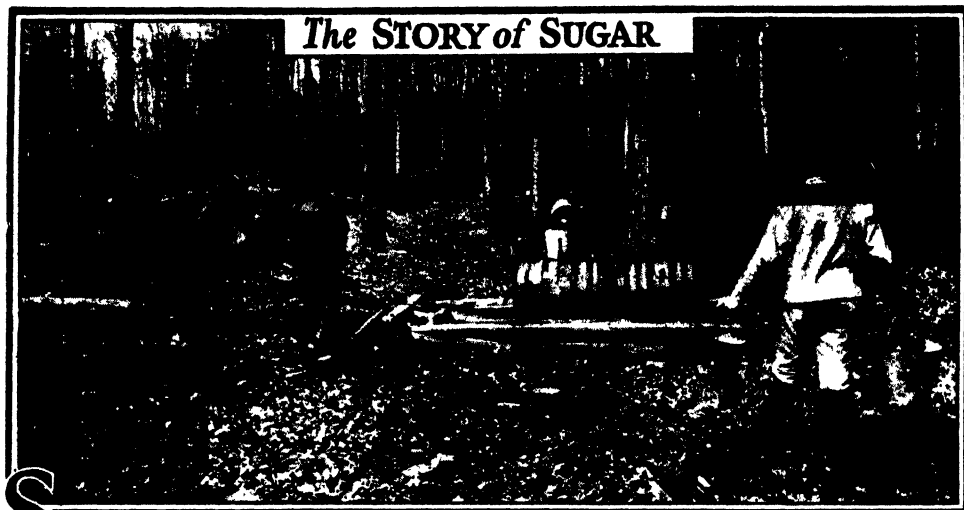
gle, and who feared the consequences should these leaders regain their political power, insisted that the whites who had participated in the war should be disfranchised, and the vote be extended to the negroes, though they were unschooled in the affairs of politics, and largely illiterate. Accordingly, Congress proposed to amend the Federal Constitution, which up to this time had left regulation of the franchise a power of the state. The Fourteenth Amendment decreed that any state denying suffrage to a male citizen twenty-one years of age, except for participation in rebellion or other crime, should suffer a reduction in its congressional representation, such reduction to be in proportion to the number disfranchised.

In order to compel the Southern states to ratify this amendment, the Reconstruction Acts of 1867 were passed, which allowed the negroes to vote, and required that a state convention ratify the amendment before it was readmitted into the Union. After the states conformed to these specifications and were readmitted into the Union, evasions of the Fourteenth Amendment became evident, and the Fifteenth Amendment was adopted. This is more definite, and states that a citizen shall not be denied the right to vote because of "race, color, or previous condition of servitude." The Southern whites were unwilling to allow the negroes to vote, because in many states they outnumbered the whites, and, moreover, they were under the influence of unscrupulous politicians (see the article RECONSTRUCTION).

In most of the states to-day, adult citizens twenty-one years of age, who are able to satisfy lenient residence requirements, are permitted to vote. Most states require a year's residence in the state; other restrictions include literacy tests, poll taxes, registration, etc. Idiots, insane people, convicted criminals, traitors, etc., are generally excluded. Aliens who have declared their intention to become citizens are allowed to vote in a few of the states. Discrimination because of sex remained quite general until the latter part of the nineteenth century. In 1869 Wyoming Territory allowed women to vote, and the provision remained in its constitution when it became a state. Slowly other states, Western ones first, enfranchised women, and in 1920 the Nineteenth Amendment to the Federal Constitution was passed, which forbade the denial of the right to vote because of sex. This became effective on August 26, 1920.

Related Subjects. The following topics may be consulted in connection with this article on suffrage:

Australian Ballot	Grandfather's Clause,
Ballot	The
Constitution (Amendments)	Short Ballot
Election	Woman Suffrage



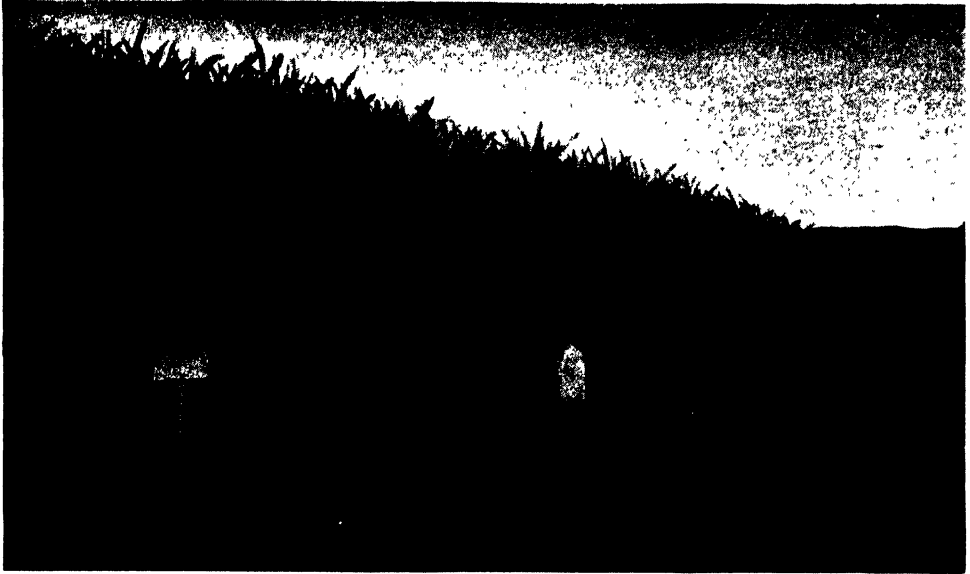
SUGAR, one of the most important foods known. It helps to form fat in the body, and is a source of energy and heat. It adds to the attractiveness of many other foods when employed as a sweetening, and, if used in moderation, makes them more digestible. The most common form—the lump or granulated sugar that appears on the table at every meal—is produced by extraction from sugar cane or sugar beets. Such sugar has a fuel value of approximately 1,800 calories per pound, and is 100 per cent carbohydrate. Maple sugar is made from the sap of the sugar maple, and contains eighty-three per cent carbohydrates, sixteen per cent water, and one per cent ash. Grapes and the date palm, as well as the nipa palm of the Philippines, are also sources of sugar, but they bear no comparison with sugar cane and sugar beets in respect to commercial importance. In Germany a method of producing sugar from wood has been perfected (see below).

Cane Sugar. A description of the cane plant will be found in the article SUGAR CANE. The sugar itself is the result of a complicated milling process. One of the more common processes is here described. The cane, after being washed and cut into short lengths, or shredded, is fed into a machine equipped with ponderous rollers from eighteen to seventy-two inches in length, which squeeze the juice from the stock. Sometimes, two or three sets of rollers are used, the pressure being increased from set to set. By this process, from ninety to ninety-five per cent of the sugar in the cane is extracted. As the sugar passes from mill to mill, water at varying temperatures is sprayed upon it from a perforated pipe. The water assists in the grinding or macerating process, and increases the amount of sugar extracted. The crushed cane, called *bagasse* (*ba gas'*), is uti-

lized as fuel to provide steam for carrying on the operations. The juice then undergoes purification, which is accomplished by applying chemicals, and by heating and filtering. Sulphur dioxide, which is used to bleach and disinfect the juice, further enables it to take up more lime—the most important chemical employed in manufacturing sugar. As soon as cane juice is squeezed from the cells of the stock, chemical inversion begins; that is, separation into fruit sugar and grape sugar. This injurious process is arrested by the addition of lime.

To produce the first sugars, the purified juice is reduced to a syrup in evaporators, and then boiled in open pans containing steam coils, or in vacuum pans, until the water is driven off and sugar crystals are formed. The resulting mass of crystals and syrup, called *massecuite*, is then carried to a mixing machine provided with revolving paddles, in which it is thoroughly stirred. From the mixer it is fed to revolving cylinders called *centrifugals*, in which the liquid portion is forced out through the meshes of a copper-gauze basket. This liquid, after being boiled and reboiled, becomes the molasses of commerce. The sugar crystals must be further refined and clarified, before ready for the market. Granulated sugar is formed in a revolving cylinder heated by steam, and loaf sugar is made by packing the fresh sugar in molds. The resulting blocks are then cut to the desired size and shape. Cheaper grades of sugar, known as *coffee* and *brown* sugar, are made from syrup yielded by first sugar.

Beet Sugar. Sugar was first extracted from the beet by a German scientist in 1747, but the industry was not developed until the nineteenth century. The beets, on reaching the factory, are first washed and conveyed to slicing machines, where they are cut by triangular



A SUGAR-CANE FIELD IN PORTO RICO

From the height of the man, it will be seen that the stalks of cane grow to twelve and fifteen feet.

knives into slices not unlike "shoe-string" potatoes. These slices drop through an upright chute into a diffusion battery, consisting of a series of tall cylinders holding from two to six tons each. These cylinders are known as *cells*. Warm water is run through the cylinders, passing from one to another throughout the battery, and drawing the sugar from the cells of the beets as it goes. This "diffusion juice," as it is called, contains from twelve to fifteen per cent of sugar. The pulp left over from this process is fed to stock. The raw juice is next purified by being mixed with lime and treated with carbonic-acid gas. The purified juice is then carried to the evaporators, where heat is applied through steam coils. Having passed through the evaporators, usually four in number, the thickened juice is conveyed to vacuum pans and heated until crystals form. It is then treated in the mixer and the centrifugal machine like cane sugar. In America, most beet-sugar manufacturers prepare their own raw sugar for the market, by putting it through a refining process. When it is highly refined, it cannot be distinguished from cane sugar.

Maple Sugar. The extraction of the sap of the sugar maple is a process that begins with the tapping of the trees in the late winter or early spring. A hole about an inch and a half deep is bored into the trunk, and into this hole is driven a metal or wooden trough, with a bucket on the end to receive the sap. Each day the sap is collected and taken to the sugar house, where it is boiled until the water content has been drawn off. This process may take place in an ordinary kettle or in a modern

steam-heated evaporator. The resulting syrup has so high a degree of purity that little clarification is necessary. Some of the syrup is poured into molds and left to harden into sugar. The black, silver, and red maples and the box-elder are all sources of maple sugar,



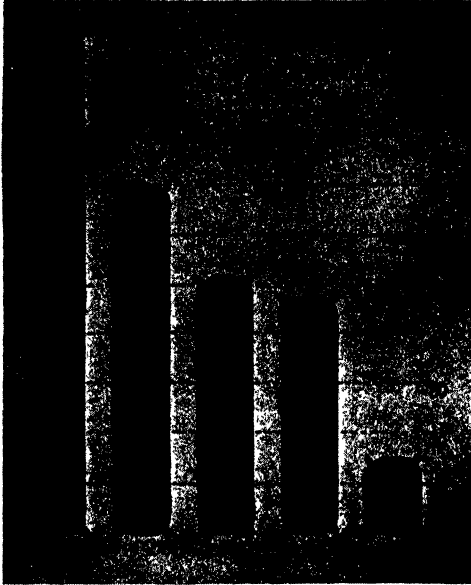
A TEST FOR PURITY

Pure sugar, when dissolved in water, should be so transparent that small type can easily be read through it.

but the greatest supply comes from the sugar maple. In the United States, Vermont and New York are the leading maple-sugar states; the latter produces about as much as the Canadian province of Quebec (see chart).

Sugar from Wood. A process for manufacturing sugar from wood reached a point in German laboratories, in 1926, where it could be utilized in industrial production on a large

scale. It is estimated that an acre of forest land can be made to yield as much sugar as an acre of ground planted to sugar beets, and the new process has the advantage of being carried out completely and continuously by machinery, without the employment of manual labor. Wood sugar is more like corn glucose



THE WORLD'S SWEET TOOTH

The diagram shows the average annual consumption of sugar per person in the five leading nations. The demand for candy in the United States has greatly increased since the advent of prohibition.

than cane or beet sugar, being less sweet, though equally nutritious. The product of the German process comes out in the form of a grayish powder, containing ninety-five per cent sugar. This can be used directly as cattle food or can be purified for human consumption.

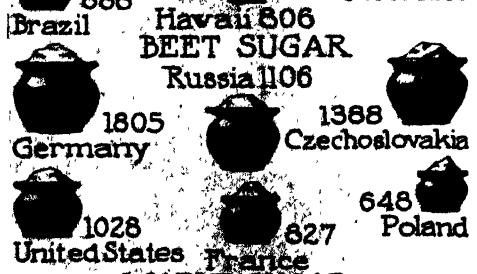
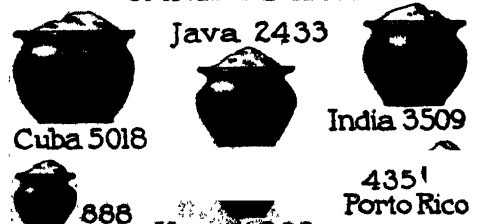
The process consists essentially in adding a molecule of water to each molecule of the cellulose of the wood pulp, which converts it into glucose. This operation is accomplished by treating sawdust with forty per cent of hydrochloric acid, in specially constructed containers made of acid-proof and heat-proof materials.

History of Sugar as a Commodity. Honey took the place of sugar in the days of the ancient Greeks and Romans. Sugar was produced in India as early as the first century, but it was hundreds of years before it was regarded as more than a delicacy or a medicine. When, in the eighth century, the Arabs conquered Spain, they introduced into that country the cultivation of sugar cane, which they had already brought over to Mesopotamia and Egypt, from India. By the close of the four-

teenth century, European traders, particularly the Venetians, were carrying on a profitable trade in sugar and spices obtained from the Orient, and when the New World was opened to exploration and development, sugar cane was one of the first plants to be propagated in the West Indies and other tropical regions of the Americas. Cane supplied most of the sugar bowls of the world until the nineteenth century, when the beet-sugar industry was organized on a profitable basis.

The people of the United States consume so much sugar that they have been said to eat their own weight of it. This is not an exaggeration, for the consumption per capita reached 100 pounds, within a decade after the close of the World War. The total amount is about one-fourth of the world's supply. The country produces about twenty per cent of its sugar requirements, chiefly beet sugar from Colorado, Utah, Michigan, California, and a few other states. The output of cane sugar,

CANE SUGAR



MAPLE SUGAR



SUGAR PRODUCTION

The sources of the greater proportion of three kinds of sugar. Figures represent average production over a five-year period.

mostly from Louisiana, is far below domestic requirements, and raw cane sugar, refined in American mills, is imported in large quantities from Cuba, Porto Rico, Hawaii, and the Philippines.

The world's production of beet sugar is, roughly, one-third of the total amount of



Photos: U & U

Harvesting Sugar Cane. At the left is a cane field in Peru, where the work is nearly all done by men. At the right, the cane harvest in Jamaica, where women perform a large part of the hard labor of the harvest.

sugar produced, or approximately 20,000,000,000 pounds out of a total of 60,000,000,000 pounds. The leading beet-sugar countries are Germany, Russia, Czechoslovakia, the United States, France, and Poland. G.M.S.

A Booklet on Sugar

Cover—In center, title, *The Story of Sugar*; at bottom, name of pupil, grade, and school.

Illustrations: In lower left corner, sugar cane; in upper right corner, group of maple leaves.

Inside cover—Blank.

Page one—Essay, *Making Cane Sugar*.

Illustrations: Broken cane stalks; cubes of loaf sugar.

Page two—Essay, *Making Beet Sugar*

Illustration: Heap of sugar beets.

Pages three and four—An original story, *When We Made Maple Sugar*.

Illustrations: Sugar maple; fire with kettle hanging above it.

Page five—Essay, *Where Sugar Is Produced*.

Illustration: Shaded maps.

Page six—Description of an experiment in crystallizing sugar (see article CRYSTALLIZATION).

Illustration: Drawing showing shape of crystals.

Page seven—Essay, *Uses of Sugar*

Illustration: Sketches of various foods into which sugar enters largely.

Page eight—*My Favorite Candy Recipe*.

Inside back cover—Blank.

Back cover—List of all plants from which sugar is made.

Related Subjects. The reader is referred in these volumes to the following articles:

Beet (Sugar Beets)	Molasses
Carbohydrates	Saccharin
Food (Chemistry of Food)	Sugar Cane
Maple	Vacuum Pan

SUGAR BERRY. See NETTLE TREE.

SUGAR CANE, a giant perennial grass cultivated in tropical and semi-tropical countries, the source of over half the sugar of commerce. Sugar cane gives off, from a thick, solid root-stock, numerous erect stems that grow from ten to fifteen feet in height and are from an inch to two inches in diameter. The stalk has no branches, but bears long and narrow leaves which are arranged in two rows. The stalk is divided into numerous short sections, sometimes sixty to eighty in number, which are connected by nodes, the sections between being known as internodes. Each node bears a small bud that looks very much like the eye of a potato. The color of the stem varies for different kinds of cane, some being yellow, others reddish, and still others green- and white-striped. Sugar cane flowers only in trop-

ical countries, but even there some varieties never blossom. The chief sugar-cane regions in the world are Cuba, British India, Java, Porto Rico, the Hawaiian Islands, and the Philippines. Nearly three-fourths of all cane sugar produced in the United States is grown in Louisiana. Small quantities are produced in Alabama, Mississippi, Florida, and Texas. So great is the consumption of sugar by the American people that the domestic supply is never adequate for the demand, and large imports are received from the insular possessions and from foreign countries.



PLANTING SUGAR CANE

The photograph shows a scene on a plantation in Peru.

Growth and Cultivation. The soils best adapted to the growing of cane are those that have a high degree of fertility and are also capable of retaining a large amount of moisture. This plant requires an abundance of water, and if the rainfall is not adequate, excellent results are obtained by irrigation. A heavy subsoil of clay is of value in preventing the washing away of soluble plant food, especially where a considerable amount of irrigating is resorted to. The alluvial soil of Louisiana



Photos: U & U

The Manufacture of Sugar. In a Michigan beet-sugar mill (top illustration), sugar is separated from syrup in centrifugal machines. Below, at left, a crude method of cane grinding in Jamaica; at right, a cane-sugar mill in Peru.



BY FLUME TO THE MILL

A scene in Hawaii. Cane is sent by flume to the mill wherever there is sloping land from the field and where the ground is too rough for vehicles.

(containing deposits of mud, sand, and gravel) yields splendid crops of cane, but there drainage is very important; in fact, almost essential. The soils of the Hawaiian Islands, which yield the heaviest crops of sugar cane in the world, are rich in lime, potash, phosphoric acid, and nitrogen.

Sugar cane is propagated for the most part by stem cuttings; seed is used principally for cross-fertilization and to produce new varieties, but not all varieties of cane bear fertile seeds. Planting may take place in the spring or fall, the latter when the spring and summer seasons are so short that spring planting might endanger maturing of the crop. If planted in the fall, the canes come up earlier, and earlier grinding is possible. A field prepared for planting has great furrows, from five to seven feet apart, running from one end of the field to the other. In these the cuttings are laid horizontally, sometimes singly and often two or three abreast. Some planters use only the upper portion of the cane for planting, some the entire cane. Others recommend planting only the matured portion. The upper portion is considered best for seed.

After the cuttings have been planted, soil is thrown over the furrows, until the cane is covered. In a short time, the buds borne on the nodes swell and burst, and a young stalk of cane emerges from the soil. Soon the leaves begin to appear, and in a few weeks the nodes and internodes may be seen. Cultivation should begin as soon as the cane has a good start, for the field must be kept free from weeds and grass. The upper part of the soil should be tilled frequently, and two or three

hoeings are also beneficial. The cane grows rapidly under favorable conditions.

Harvesting. Hand cutting of the cane has been found more satisfactory than machine cutting. On large plantations, scores of cutters are employed, each of whom is provided with a large steel knife carrying a blade five inches wide and eighteen inches long, and having on the back a small hook. As the cutters work their way down the long rows, they cut the cane close to the ground, stripping off the leaves with the hook, and topping the stalks at the last matured joint. The cut stalks are thrown into heaps called windrows, then gathered up into carts or rail cars, to be carried to the sugar factory. The stubble left in the field will produce a second or third crop in Louisiana, and from five to ten crops in tropical countries. Annual or biennial planting, however, is customary, as the fields ordinarily do not give profitable yields unless replanted frequently.

G.M.S.

Scientific Name. The sugar cane plant belongs to the family *Gramineae*. Its botanical name is *Saccharum officinarum*.

Related Subject. For description of the process of extracting sugar from the cane, see the article SUGAR, where there is also an illustration of growing sugar cane.

SUGAR LOAF. See RIO DE JANEIRO, illustration.

SUGAR OF LEAD. See ACETIC ACID; LEAD.

SUGAR OF MILK, OR LACTOSE. See CARBOHYDRATES.

SUGAR TROUGH. See GOURD.

SUGGESTION, sug jes' chun, the influencing of conduct by presenting a pattern for imita-

tion, or indirectly inviting a desired and natural reaction. It commonly carries the implication that the process is introduced unawares, without arousing the consciousness of the "suggested" person in the direction of the suggested response. The mechanism by which yawning is contagious is rather obvious; the sight of another yawning intensifies or releases slight tendencies in the same direction; the sight of others eating makes one hungry. When a lecturer, to illustrate the point, moves his hands open and shut, like a pair of jaws, and induces a yawn among the more responsive of his audience, the mechanism is a little more indirect.

The mechanism of suggestion in the way of inducing belief is equally important. This appears realistically in the psychology of *conjuring* (which see). When all the movements of throwing a ball into the air are performed, the spectator is convinced by the suggestion of the appearance that he saw the ball in the air (when actually it was dropped under a table); or, again, the spectator is convinced that coins are dropped into a hat by the tossing movements of the right hand (which is quite empty), when really the coin is dropped from the left hand, which holds the hat. The illusion—as is true of many illusions—is the result of suggestion. Similarly, an inference is drawn from a set of premises suggestively arranged; as in the methods of a criminal in establishing an alibi or covering up his tracks.

Suggestion refers also to the process of inducing consent without arousing opposition. Children must be guided by suggestion as often as by command. As soon as the will realizes that it is being led, it asserts its self-direction; suggestibility is a ready acquiescence, a will that yields easily to another's direction. It is along the same lines that an undesirable belief or a symptom is removed by suggestion; a sugar pill may be given as medicine with the suggestion that it will have a desired effect, and the effect follows; a mock operation may be gone through with, and the patient, convinced of a cure, finds himself rid of the trouble.

Suggestion as a procedure enters into the psychology of many practices (see FAITH CURE; HYPNOTISM). Normal suggestibility has its limits; it must as a rule proceed cautiously and indirectly; abnormally, it attains almost incredible proportions, and may proceed openly and forcibly. The psychology of persuasion (as an example, Antony's oration over the body of Caesar) and the psychology of advertising must likewise study the subtler suggestive tendencies of the mind that influence action.

Auto-Suggestion. Since the usual meaning of suggestion is action through the influence of another, the term *auto-suggestion* refers to the adoption of the same technique, for the purpose of influencing behavior by yourself.

There is no real, only an apparent, contradiction in the term. For when you yield to an undesirable suggestion and become afraid in an epidemic of influenza, for example, because you are surrounded by timid people, you do not yield wholly; you still try to act sanely and reasonably. Moreover, if you counteract this suggestion of panic with the reflection that you cannot do anything but take precautions; that you cannot run away or hide from germs; that you, as a leader, should set an example of calm; and that, after all, you do not want to succumb to fear—all this is auto-suggestion. You are giving as well as receiving the suggestion; but it is not quite the same part of your mental organization that is giving and receiving.

So, similarly, you may be despondent about your health, and find yourself losing ground. A friend or a professional adviser comes, and insists that you will get well. To give you something to hold on to, that person prescribes a formula: "Day by day, in every way, I am getting better and better"; and you fall in with the scheme and improve. The auto-suggestion is but the reinforcement of the idea suggested to you. After all, you accept a suggestion, whether you do so knowingly or not, and with or without resistance.

Auto-suggestion includes the technique of letting a suggestion lie around, so that it is likely to be seen and acted on, and accepted as though you were acting on your own initiative; that is like the forced card that the conjuror makes you take, though you think you made the choice. Auto-suggestion may act in an indirect way, and by appeal to subconscious mechanisms. But *auto-suggestion* more typically aims directly at coöperation. You try to train your subject to take matters in his own hands, to dismiss his fears, and give himself a self-treatment in courage. Thus again, suggestion and auto-suggestion have overlapping phases.

It is, however, more in frightening yourself than in getting rid of your fear that auto-suggestion applies; and what is true of fears is even truer of ailments and other undesirable states of mind. Even in anger, which is more impulsive, you work yourself up into wrath; or you exercise calm and control, by suggesting to yourself that you must hold back and not let yourself go. When a patient has a peculiar sensation in the heart or the groin, and becomes convinced that he has heart trouble or kidney trouble, and in his concern looks up the subject in a medical book, then he is sure that he is so afflicted; you call it auto-suggestion, merely because a thought or a printed statement, and not some other person, made the suggestion.

If the patient speaks about his symptoms to a friend, and he puts that idea of heart

failure or kidney failing into his head, the process is different only because, while all of us are social, some of us are quite dependently so, and follow social patterns and others' opinions more readily than our own; this means that we are easily suggestible. So M. Coué, the French exponent of auto-suggestion, was in many ways wrong, but in this respect was right: he always maintained that he did not cure people; he had no special power; he only helped them to cure themselves. Hence he called his method auto-suggestion. But, as a matter of fact, the prestige of his success helped many a patient who had done his best to auto-suggest himself into health, but without much success, to summon that additional power that sent him over the top to victory.

We are exposed to the influences of suggestion, both helpful and harmful, quite as generally in that private struggle that we are ever conducting in behalf of mental fitness, as in the social setting in which we look to others for help and guidance. In so far as socialized suggestion is the more frequent and effective, we are apt to think of suggestion as directed from without. Because we are gregarious (not solitary) animals, we are socialized in our responses, and because we are thus socialized, we are suggestible for good or bad. But since we are constantly exposed to all sorts of suggestions, and could not possibly respond to them all, the selection we exercise in determining what suggestions we shall accept, and what we shall reject, is typically present, and comes closer to the auto-suggestion formula.

It is when we have fallen into bad mental habits and are worried about our health, when we feel that we are not strong and need to lean on others, that we need help in our auto-suggestive efforts. If auto-suggestion in the right direction is so weak because auto-suggestion in the wrong direction is so strong, such powerful resistance may need to be overcome by so drastic a method as hypnosis. When hypnotized, your resistance is put to sleep, and you are more completely at the call of the suggestion by another. The hypnotizer seemingly can mold you like clay, and you will find yourself, on awakening, in command of powers that you could not summon by yourself; you may then go on and continue in the path of auto-suggestion. This method has often worked well in cases of sleeplessness. The underlying principle and mechanism employed vary. Both terms serve a useful purpose. j.j.

Relating to Various Beliefs. The articles on the following topics are of interest in this connection:

Alchemy
Astrology
Clairvoyance
Conjuring

Demonology
Divination
Faith Cure
Hypnotism

Magic
Medium
Mesmerism
Mind Reading
Necromancy
Occult
Palmsistry
Phrenology

Physiognomy
Psychical Research
Psychoanalysis
Spiritualism
Subconscious
Superstition
Telepathy
Witchcraft

SUICIDE, *su' ih side*, intentional death by one's own hand. Attempts have been made to show that the tendency toward suicide is an accompaniment of civilization—that a savage never takes his own life. While the facts do not support this extreme view, it is true that it is much less common among barbarous than among civilized peoples.

Christianity has always opposed suicide, accounting it a sin; and statistics show that the deterrent effect of religion is very great. It is true that in practice the appeal of religion on this subject is not always to the highest emotions, but that it often deters through threats of punishment after death. Among Christian people, suicide is far more common with Protestants than with Roman Catholics. It is, however, less common among Jewish people than among Roman Catholics. In Japan, suicide under certain conditions is considered an act of honor (see HARA-KIRI).

Statistics on the subject of suicide are rather meager and unsatisfactory, for there are usually reasons for secrecy regarding the facts in a case, and many instances of suicide are not so reported. There is, however, sufficient statistical material to show certain very marked tendencies, some of which seem almost unaccountable. That there should be differences in nationalities might be expected, not only on account of climate, but on account of national divergences of temperament; and these differences are very marked. Saxony, a division of the German republic, leads all other countries in relative number of suicides; Ireland has fewest, in proportion to population.

The difference between the sexes is also very marked, and the proportion varies little from year to year in different countries, approximately three or four males committing suicide to each female. The modes chosen by men and women vary, too, men choosing hanging or cutting most frequently, while women prefer drowning or poison. As to age, there are evident certain definite tendencies. In general, it may be said that the age at which women tend to commit suicide is much lower than that for men, pointing, doubtless, to a decided difference in cause. Among all classes, the maximum is reached between fifty-five and sixty-five.

Other facts shown by statistics are that single people commit suicide oftener than married people; that professional classes and military men show a far greater tendency toward self-destruction than do the laboring

classes; and that the late-spring and early-summer months, without exception, show more suicides than do the other months.

Though statistics are not exact enough to establish such a point beyond question, it seems that the propensity to commit suicide is increased by education. It is also true that suicide is more prevalent in urban than in rural districts.

At various times, laws have been passed which aim to serve as deterrents of suicide, but they are not effective; one knows that if he succeeds in his attempt at self-destruction, the law will be powerless.

SUISUN, *soo e soon'*, BAY. See SACRAMENTO RIVER.

SULEIMAN, *soo lay mahn'*. See SOLYMAN II.

SULGRAVE MANOR, a village in Northamptonshire, England, regarded as the ancestral home of George Washington. It was in the possession of the Washington family from 1538 to 1610, when it was sold by Robert Washington and his son Lawrence. The manor house was bought in 1914 by the British Commission for the celebration of the hundred years of peace between England and the United States. The large house is fairly well preserved. American patriotic societies assisted in the suitable furnishing and restoration of the interior.

SULLA, LUCIUS CORNELIUS (138-78 B.C.), a Roman general and statesman, known as **FELIX** (THE FORTUNATE), and famous as the opponent of Marius. He was of patrician rank, received an excellent education, and entered the army, seeing his first military service of note in the campaigns of Marius against Jugurtha, in Africa. Here he was very successful, and he repeated his triumphs in the wars against the Teutones and Cimbri, which raised Marius to the height of his power. In 93 B.C., Sulla was made praetor, in the next year went as governor to Cilicia, and on his return to Rome, in 91 B.C., did such excellent service during the Social War that Marius became intensely jealous of him. As a reward for his successes, he was made consul in 88 B.C. and entrusted with the conduct of the war against Mithridates, an honor which Marius greatly desired. The ill feeling between the two resulted in a riot, headed by the adherents of Marius, and Sulla was compelled to escape from Rome to his troops in Campania. At the head of his legions, he returned to Rome and drove out Marius.

From 87 to 83 B.C., Sulla was engaged against Mithridates, whom he at last forced to submit to Rome, and on his return found himself powerful, Marius having died during his absence. The Marian party, however, had still to be crushed, and this Sulla had accomplished by the beginning of 81 B.C.

He celebrated his victories by putting to death thousands of his enemies throughout Italy, instituting a veritable "reign of terror"; then he had himself declared dictator for an unlimited term. The laws which he promulgated were all directed toward the restoration of the powers of the Senate and the aristocratic party. In 79 B.C. he resigned, and spent his last year in retirement.

Related Subjects. The reader may consult the following articles in these volumes:

Dictator
Marius, Caius
Mithridates
Patrician

Praetor
Rome (Last Century
of the Republic)

SULLIVAN, MRS. ANNE. See KELLER, HELEN.

SULLIVAN, SIR ARTHUR SEYMOUR (1842-1900), an English composer who won fame in the field of light opera and in sacred music, was born in London. His father was an Irish bandmaster and music teacher of much ability, and the son so early learned the rudiments of the art that, at the age of eight, he could play any wind instrument. When he was twelve years old, he was admitted as a singer in the Chapel Royal at London, and two years later won the Mendelssohn scholarship at the Royal Academy of Music. Under this scholarship, he went to Leipzig Conservatory.

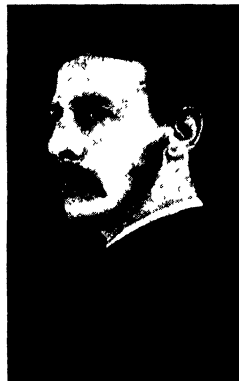


Photo: Brown Bros.

SIR ARTHUR SULLIVAN

In 1861 he returned to London, where, early in the next year, his music to Shakespeare's *Tempest* was played in the Crystal Palace. For some years he was organist at Covent Garden theater, London, and professor of composition at the Royal Academy, but after 1875 practically all his energies were devoted to collaboration with W. S. Gilbert in the production of their famous light operas.

His Principal Compositions. Sullivan accomplished the unusual feat of producing artistic music which was genuinely popular with the masses of the people. His earlier works, such as the *Kenilworth Cantata*, with its beautiful duet, *How Sweet the Moonlight*, and the songs from Shakespeare, such as *Oh, Mistress Mine* and *The Willow Song*, are universally admired, while the operas written with Gilbert, such as *H. M. S. Pinafore*, *Pirates of Penzance*, *The Mikado*, *Patience*, *Iolanthe* and *The Gondoliers*, became known around the world. It should not be forgotten that Sullivan also composed sacred music of a high standard. His *Te Deum*, *The Light of the World*, *The Golden Legend*, and his hymn, *Onward, Christian Soldiers*, are among the most notable specimens. His

musical setting of Adelaide Procter's *Lost Chord* has made that poem a universal favorite.

SULLIVAN, JOHN L. See PRIZE FIGHTING.

SULLIVAN'S ISLAND, an island in the harbor of Charleston, S. C., and the site of Fort Moultrie (which see).

SULLYS HILL NATIONAL PARK. See PARKS, NATIONAL.

SULPHATES, salts of sulphuric acid. As a rule they are stable crystalline compounds, more or less soluble in water, with the exception of barium, strontium, and lead sulphates. Sulphates are very important. The following minerals—heavy spar, gypsum, celestite, and Epsom salt—are sulphates of barium, calcium, strontium, and magnesium, respectively. Copper sulphate, or blue vitriol, is used in a variety of industries, including dyeing and calico-printing; iron sulphate is used in making ink and as a medicine; manganese sulphate is employed in calico-printing; zinc sulphate in surgery, in calico-printing, and in drying oils for varnishes. A double sulphate of potassium and aluminum, known as alum, is a constituent of some baking powders. Every sulphate contains a group of associated atoms of sulphur and oxygen.

T.B.J.

Related Subjects. The following articles in these volumes should be read in connection with this subject:

Alum	Gypsum
Barium	Magnesium
Blue Vitriol	Strontium
Calcium	Sulphuric Acid
Epsom Salt	Zinc

SULPHUR, *sul' fur*, a very common non-metallic element, one of the most useful substances known. It is not only essential for the life and growth of plants and animals, but is found, directly or in combination, in practically every manufactured product. Sulphur is present in the human body in the proportion of .25 per cent. It is one of the constituents of proteins. It occurs in many plants used on the table, such as onions, cabbage, garlic, horse-radish, and mustard, and in eggs. The disagreeable odor of rotten eggs is caused by the formation of a sulphur and hydrogen compound. Sulphur also forms a sulphide with silver, and a silver spoon used with eggs will show a blackish tarnish for this reason.

Sulphur has been known from the earliest ages, and because it burns at a low temperature, it was formerly called brimstone (*burn-stone*). It is found abundantly in a pure state in volcanic regions, and is also freely distributed in combination with other substances, notably metals. With several of these it forms valuable metallic ores, including pyrites, a sulphide of iron; galena, a sulphide of lead; blende, a sulphide of zinc; cinnabar, a sulphide of mercury; and stibnite, a sulphide of antimony. Calcium sulphate, or gypsum, is the most abundant mineral containing sulphur and oxygen.

Properties. Sulphur is a chemical element with the symbol S. It exists in several different physical forms, all identical chemically, and affording a good example of the property of allotropy (which see). Ordinary lump sulphur is a pale-yellow, crystalline, brittle solid, almost tasteless, and capable of giving out a peculiar odor when rubbed or melted. It is a poor conductor of both heat and electricity. It melts into a yellow liquid at the comparatively low temperature of 230° F., and possesses the peculiar property of becoming viscous or of solidifying, when heated to a higher degree. At about 482° F., the fluid is so thick that it cannot be poured from the vessel, but it becomes fluid again when the temperature is raised above that point. Sulphur boils at 832° F., emitting a yellowish-brown vapor, which condenses in closed vessels in the form of a fine, yellow powder called flowers of sulphur. The roll sulphur of commerce is made by pouring sulphur in fluid state into cylindrical molds, where it is cast.

Sulphur ignites readily at a low temperature, and burns with a pale-blue flame, forming sulphur dioxide, which is a colorless gas. Divided into very fine particles, it oxidizes in moist air and forms sulphuric acid. This process takes place in the atmosphere of large cities which burn a large amount of coal and gas for industrial and domestic purposes.

Production. Formerly, Sicily was the chief source of the commercial supply of pure sulphur, but the United States now has the leading place in the trade. Texas is the chief producer. There are large sulphur deposits in Louisiana, but little development of the mineral is being carried on.

Uses. Sulphur is mixed with saltpeter and charcoal to form gunpowder, and is indispensable in the manufacture of rubber goods. Taken internally, sulphur is a mild laxative. Its occurrence in mineral waters gives them special value in the treatment of rheumatism. Sulphur baths are prescribed for eczema and other skin affections, and sulphur ointment is a cure for itch and ringworm. Sulphur is also employed to some extent in the manufacture of matches. In farm practice, sulphur preparations are widely used to kill insects and plant diseases. Sulphur and its compounds have so many uses, in fact, that it is impossible to enumerate them all in an article of this length. Sulphuric acid, for example, enters into the manufacture of fertilizer, alum, dyestuffs, explosives, and bleaching preparations, and is important in the electroplating, oil-refining, and mining industries. Sulphur dioxide is a bleach and disinfectant. By the action of calcium bisulphite on wood cellulose, paper pulp is made. Sodium thiosulphate is used in fixing photographs. This list could be indefinitely extended.

T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Brimstone	Paper
Chemistry	Rubber
Gunpowder	Sulphates
Insecticides	Sulphureted Hydrogen
Minerals	Sulphuric Acid
Mineral Waters	

SULPHURETED HYDROGEN, *sul fu-ret' ed hi' dro jen*, OR **HYDROGEN SULPHIDE**, *sul' fide*, a poisonous gas with the odor of rotten eggs, is a compound of sulphur and hydrogen. It occurs in mineral waters, and wherever organic compounds containing sulphur are decomposed, as in the air about cesspools and sewers. It is made in the laboratory by the action of hydrochloric acid on iron sulphide. The gas burns with a bluish flame, is colorless, has a sweet taste, and is slightly soluble in water. The solution reddens blue litmus, and when it decomposes, it deposits sulphur. Dissolved in mineral waters, it has medicinal properties in rheumatism and skin diseases. Its most important use is as a reagent in the chemical laboratory, for analyzing other substances. T.B.J.

Chemical Formula. The formula for sulphureted hydrogen is H_2S ; that is, a molecule contains two atoms of hydrogen and one atom of sulphur.

SULPHURIC ACID, OR **OIL OF VITRIOL**, an oily liquid manufactured in great quantities for use in numerous industries. This acid is indispensable in the manufacture of explosives, artificial fertilizers, alum, nitroglycerine, glucose, phosphorus, and dyestuffs, and in the bleaching, electroplating, oil-refining, and mining industries. It is employed in the making of sodium carbonate (soda), which in turn is used in manufacturing soap and glass, and is an essential factor in the production of all other mineral acids. The manufacture of sulphuric acid is based upon the fact that it is formed when sulphur dioxide, the common compound of sulphur and oxygen, oxidizes in the presence of water. Its salts are called *sulphates* (which see).

When pure, the acid is colorless and odorless. It has great affinity for water, which it absorbs quickly from many organic substances. For this reason, it makes painful wounds if it touches flesh. In accidents of this kind, the acid should be washed off with water and the wound treated with sodium bicarbonate or limewater. Sulphuric acid chars wood, paper, starch, and sugar, and is often employed in the laboratory to dry gases, for it absorbs moisture from the air and from gases passed through it. Four parts of acid to one part of water raises the temperature of the water to boiling, and if the two are mixed, the acid should be poured into the water, not vice versa; otherwise, the containing vessel may be cracked by the sudden access of heat. T.B.J.

Chemical Formula. The formula for sulphuric acid is H_2SO_4 ; that is, a molecule contains two atoms of hydrogen, and the radical SO_4 . The latter is a group consisting of one atom of sulphur and four atoms of oxygen, which remain in association, acting as one atom, in chemical reactions.

SULTAN, an Arabic title of honor, used since about A.D. 990, and applied to Mohammedan princes and rulers. The word means *emperor* in the modern sense, but more anciently referred rather generally to one who was mighty or imperious. The sultan of greatest dignity was the ruler of Turkey, prior to the new political order in the former Ottoman Empire; to set him apart as greater than any other bearing the title, he was officially known as *sultan khan*, or *reigning sultan*. The form *sultana* was applied to the mother, wife, or daughter of the sultan.

SULTE, *suhl*, BENJAMIN (1841-1923), a Canadian poet and historian, author of *Histoire des Canadiens-Français* (History of the French-Canadians), an authoritative work. Sulte was born at Three Rivers, Que. After the death of his father, the son at an early age left school and had to work for a living. He drifted through various employments, until he finally entered the service of the Dominion government as a translator. This work he continued for thirty-five years.

Other Works. In addition to the solid eight-volume *History of the French-Canadians*, Sulte wrote *Histoire de St. François du Lac* (History of Saint Francis of the Lake), a history of Quebec, and two volumes of verse, *Les Laurentiennes* and *Les Chans Nouveaux* (New Songs). Many of his writings have appeared in journals and periodicals. See CANADIAN LITERATURE (French Canada).

SULU ISLANDS. See PHILIPPINE ISLANDS (Some of the Islands in Detail).

SUMAC, OR **SUMACH**, *su' mak*, a genus of small trees or shrubs of temperate regions, consisting of about 120 species, many of which are commercially important. Of the North American sumacs, one of the best-known is the *staghorn sumac*, whose range is from Southern Canada to Georgia and Mississippi. It is an attractive flat-topped tree, growing thirty or thirty-five feet high, and bearing fernlike leaves, small, greenish flowers, and tiny red berries. In the autumn, the foliage of this sumac is a wonderful combination of flaming scarlet, orange, and purple, but the summer leaf is velvety, dark green above, and pale beneath. The branches of the tree are forked many times; before it is mature, they are covered with a soft, velvety down. The fruit clusters and leafstalks are extremely hairy. From the soft, brittle wood are made walking sticks, and inlay work for boxes and ornamental objects. Not less attractive than the staghorn is the *dwarf, black, or mountain sumac*, found all over the Eastern United States and beyond



BATTAK WOMEN AND CHILDREN

The Battaks live in Northern Sumatra, and are semi-civilized. In the illustration the ladies of the household are seen making the cloth necessary for the very limited amount of clothing needed by the family.

the Mississippi River, west to the Rockies. In the Tennessee and North Carolina mountains, it grows as tall as the staghorn, but is

A sumac bearing white berries is found in swampy land from New England to Minnesota and from Georgia to Texas. This is the *poison sumac*, which all people should avoid. Like its harmless relatives, it is a tree of beautiful foliage, but can always be recognized by its fruit, which hangs in drooping clusters. The red berries of the harmless sumacs are in dense, erect clusters. The effects of poison sumac are much like those of poison ivy (see IVY); though fewer persons are susceptible to sumac poisoning, those who are afflicted suffer more severely. The remedy is a five per cent solution of potassium permanganate. Washing the hands and face with a five per cent solution of ferric chloride, in a 50-50 mixture of glycerine and water, is a preventive.

The *smooth-leaved sumac*, which usually grows only three feet high, is a species found east of the Rocky Mountains, from Arizona to British Columbia. The unripe summer berries are used in making a refreshing drink, and the bark, leaves, and fruit are used in treating fevers.

B.M.D.

[The name sumac was formerly spelled *shumac*, and is still often pronounced as if so written.]

Scientific Names. The sumac genus, *Rhus*, belongs to the cashew family, *Anacardiaceae*. The staghorn sumac is *R. hirta*; the dwarf, *R. copallina*; the poison, *R. vernix*; the smooth-leaved, *R. glabra*.

SUMATRA, *soo mah' trah*, the second largest island of the Sunda group, in the Indian Ocean,



Photo: Visual Edge

STAGHORN SUMAC

usually a shrub. As its leaves are rich in tannin, they are employed in tanning leather, and from them is extracted a yellow dyestuff.



TYPES OF SUMATRA NATIVES

Photos OROG

At left, a bride and groom of the Battak tribe. The brides among them either have their front teeth filed down to the gums or have them extracted, as every girl who marries must get rid of her front teeth. At right, a Sudanese chieftain in Southern Sumatra, with his family; the residence is in the background.

one of those rich Oriental lands which contribute their wealth to European owners and rulers. In this instance, the proprietor is the Netherlands. (See map, accompanying article PACIFIC ISLANDS.)

Lying across the equator, southwest of the Malay Peninsula, with an area of 163,138 square miles, Sumatra somewhat resembles California in shape, and has a population of over 5,800,000, of whom fewer than 50,000 are white. Some of the native tribes are still savage enough to be troublesome; all of them are of Malayan and Hindu origin. The mountains are rich in minerals; the forests furnish teakwood, bamboo, and valuable gums; in the fertile valleys grow the pepper and tobacco of Sumatra's important European and Chinese trade. Rubber production is constantly increasing. Valuable petroleum fields are being exploited by Dutch and British capital; in 1921 certain oil interests in the United States attempted to secure concessions in the rich Djambi districts, but the rights had already been granted.

Europe first heard of Sumatra, through a Portuguese explorer, in 1508, and the first European trading posts on the island belonged to Portugal. In the seventeenth century, the British founded a colony on the southwest coast, but after a long period of rivalry with the Dutch, who had colonized the island in 1618, they withdrew in 1824.

The Dutch governor-general, assisted by a council and the resident governors of the various districts, has absolute executive authority, except that he is responsible to the home government. In 1917 a legislative assembly, the Volksraad, with restricted powers, was established, and in 1925 an additional share of self-government was granted in internal affairs.

There are a few large cities; the most important of these are Palembang, in the southeast; and Bencoolen and Padang, on the west coast. Dutch engineers have built highways connecting the east and west coasts, military roads, and railroad lines from Padang. See EAST INDIES, DUTCH.

SUMIDA, *soo' me dah*, RIVER. See TOKYO.

SUMMERALL, CHARLES PELOT (1867-), a distinguished officer of the United States army, and chief of staff since 1926. He is one of eight men who, in the history of the nation, have held the rank of general. The others were Washington, Grant, Sherman, Sheridan, Bliss, March, and Pershing. General Summerall was advanced to this rank in 1929.

His life is an example of complete devotion to a single pursuit—the army. He was born at Lake City, Fla., and at the age of eighteen was graduated from Porter Military Academy, at Charleston, S. C. In 1892 he completed the course at the United States Military Academy and, between that date and 1920, advanced through all grades of the service from second lieutenant to major general.

Prior to the World War, Summerall conducted campaigns in the Philippines, and was with the China Relief Expedition in 1900-1901. He located and negotiated the purchase of several military reservations and field-artillery training camps, among them being those at Tobyhanna, Pa., Anniston, Ala., and Monterey, Calif. From 1905 to 1911, he acted as senior instructor in artillery tactics at West Point.

At the outbreak of the World War, Summerall was made a member of the military mission to England and France. In October, 1917, he joined the American Expeditionary Forces in France, as commander of the 67th Field Artillery Brigade. The following year he became commander of the First Division, Field Artillery. Some idea of the service he rendered may be gained from the many decorations which he received. The following is but a partial list: D.S.C. (U.S.), for gallantry in the Battle of Soissons; D.S.M. (U.S.), for meritorious and distinguished services as brigade, division, and corps commander; Legion of Honor and Croix de Guerre, with two palms (French); Grand Officer, Crown of Belgium; Commander, Order of the Crown (Italian); Military Medal (Panamanian); Order of Prince Danilo I (Montenegrin); Victory Medal of the United States. He was engaged in five major operations with the A.E.F. in the World War.



Photo: Wide World

CHARLES P. SUMMERALL

After the war, he was a member of the inter-allied military commission at Fiume, and served with the American mission to negotiate peace in that dispute. He was commander of various army corps until his appointment as chief of staff.

SUMMONS. See COURTS (Court Procedure).

SUMNER, CHARLES (1811-1874), an American statesman of the period of the War of Secession, one of the most outspoken and fearless of the anti-slavery leaders. Lincoln spoke of him as "my idea of a bishop," because he so courageously denounced whatever he thought to be wrong. Sumner was born in Boston. After completing a course at the Harvard Law School, he was admitted to the bar (1834). Between 1837 and 1840, he traveled in Europe, and on his return home began actively to oppose the extension of slavery. In 1851 the Free-Soil party of Massachusetts, by combining with the Democrats, brought about his election to the United States Senate, and he remained a member of that body until his death.

Sumner's zeal as an anti-slavery leader led to an assault upon his person. In 1856 he delivered a fiery speech entitled *The Crime Against Kansas*, in which he severely criticized one of the Senators from South Carolina. In retaliation, a Southern Congressman, Preston Brooks, attacked him with a cane while he was alone in the Senate chamber, injuring him so seriously that for three years he was unable to appear in public life. Late in 1859, he resumed his place in the Senate.

He was an ardent worker for enfranchisement of the negro, and he approved the impeachment of Johnson. He was one of the first to advocate civil service reform.

In 1872 Sumner joined the Liberal Republicans, whose candidate for the Presidency was Horace Greeley, for he disagreed with Grant on the latter's home and foreign policies.

SUMPTUARY LAWS. The word *sumptuary*, like *sumptuous*, comes from a Latin word meaning *expense*, and sumptuary laws are regulations to limit the amount of money spent on private luxuries. Modern political economy does not consider such laws legitimate, because they interfere with personal liberty; but the idea in the past was that, by checking extravagance, authorities could lessen poverty and crime.



Photo: Brown Bros.

CHARLES SUMNER

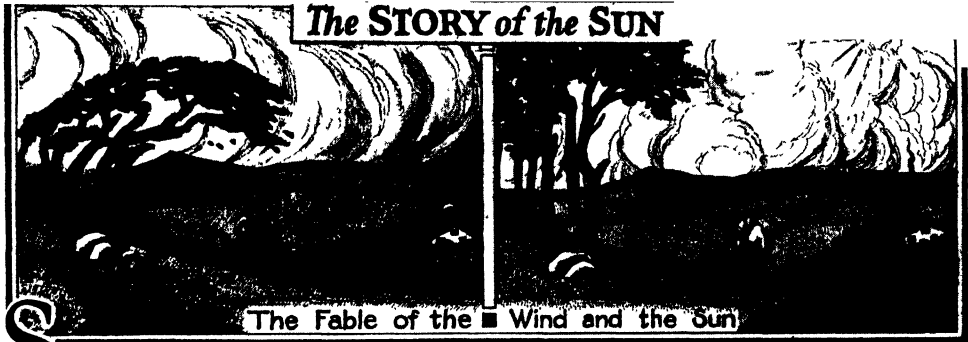
The sumptuary laws of ancient Greece and Rome forbade elaborate funerals, costly banquets, and gold and silver embroidery on women's robes; at one time, indeed, there was a Roman edict punishing guests as well as hosts, if the entertainment was more lavish than the laws permitted. Similar laws have been common at various times in England, France, Scotland, Spain, and Italy. From the time of Edward III until the Reformation, the English Parliament regulated the number of courses to a meal—two, except on holidays—and the dress expenditure for each class of society. Only the very wealthy might wear

silk, this restriction being intended, in part, to encourage woolen manufacture in England.

The nearest approach to sumptuary laws the world has to-day is found in legislation covering the liquor traffic, such as license and prohibition laws. However, as their primary purpose is to protect public health and morals, they are generally considered as coming under the head of police regulations. See BLUE LAWS; CONSUMPTION (in economics); PROHIBITION.

SUMTER, FORT. See FORT SUMTER.

SUMTER, S. C. See SOUTH CAROLINA (back of map).

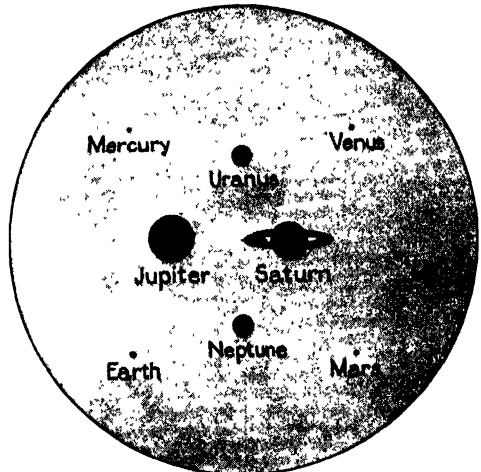


SUN, the most conspicuous of the heavenly bodies and the center of the solar system, regarded by astronomers as a star, and believed to be a gaseous mass, with its atoms stripped of most of their electrons. The earth is dependent on the sun for heat and light; no form of life could exist on the planet we inhabit, if the influence of the sun were withdrawn. To us on earth the sun is therefore by far the most important object in our stellar system; in reality, though, it is only one of thousands of stars, and not even one of the largest.

The Sun's Surface. All that can be seen of the sun by an observer on the earth is merely its shining surface, so intensely bright that the naked eye cannot endure to look at it. Astronomers call this shining surface the *photosphere*. A cloak, or envelope, of flaming hydrogen, surrounding the sun, is called the *chromosphere*, and shows red, like a burning mass, through the spectroscope. The prominences observable are vast clouds of hydrogen extending up from the chromosphere, thousands of miles high, beside which the earth would be but a speck. During eclipses, there may be seen a still more vast, luminous envelope, called the *corona* (see below).

Size and Density. The diameter of the sun is approximately 864,000 miles, or 109 times that of the earth; its distance from the earth is about 93,000,000 miles. It would take fourteen years for sound to travel from the sun

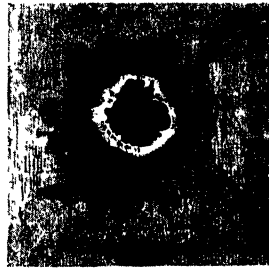
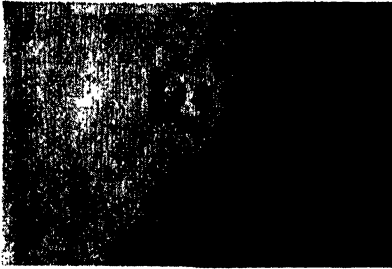
to the earth. If an explosion occurred on the sun and the sound could possibly travel so far, we should hear the explosion fourteen years after it had happened. The sun's surface area



SOME COMPARATIVE SIZES

The sun is represented by the large outer circle.

is 12,000 times and its volume 1,300,000 times that of the earth. Since its density is 1.41 times that of water, it is much less dense than the earth, whose density is $5\frac{1}{2}$ times that of water.



SUN SPOTS, REPRODUCED FROM PHOTOGRAPHS

At left, spots seen near edge of the sun. The second illustration shows a spot, rounded at first, finally becoming bridged over with projections, as seen in the third picture.

Gravity on the sun's surface is 27.9 times as great as on earth; a person weighing 150 pounds on earth would weigh nearly two tons on the sun, and a body falling onto the sun's surface would fall 450 feet the first second, while on the earth the fall in the first second would be 16.08 feet. On the sun's surface, if it were possible to get there, a human being could not lift hand or foot, but would probably be crushed by his own weight.

Apparent Motion. To dwellers on earth, the sun appears to move through the heavens. As a matter of fact, the earth moves round the sun, but we are unable to feel that motion.

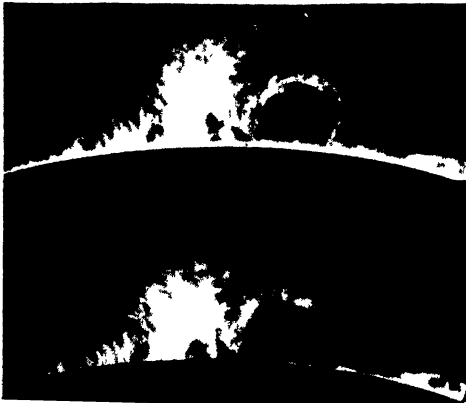


Photo: Visual Education Service

HYDROGEN FLAMES FROM THE SUN

In the spring, the sun rises a little farther north of east each day for three months in the northern hemisphere. At the summer solstice, it appears to stay at the same height for a few days, then starts on its journey southward. It not only moves north and south, but continually advances eastward among the stars, rotates on its own axis in twenty-six days, and completes a circuit of our heavens in a year.

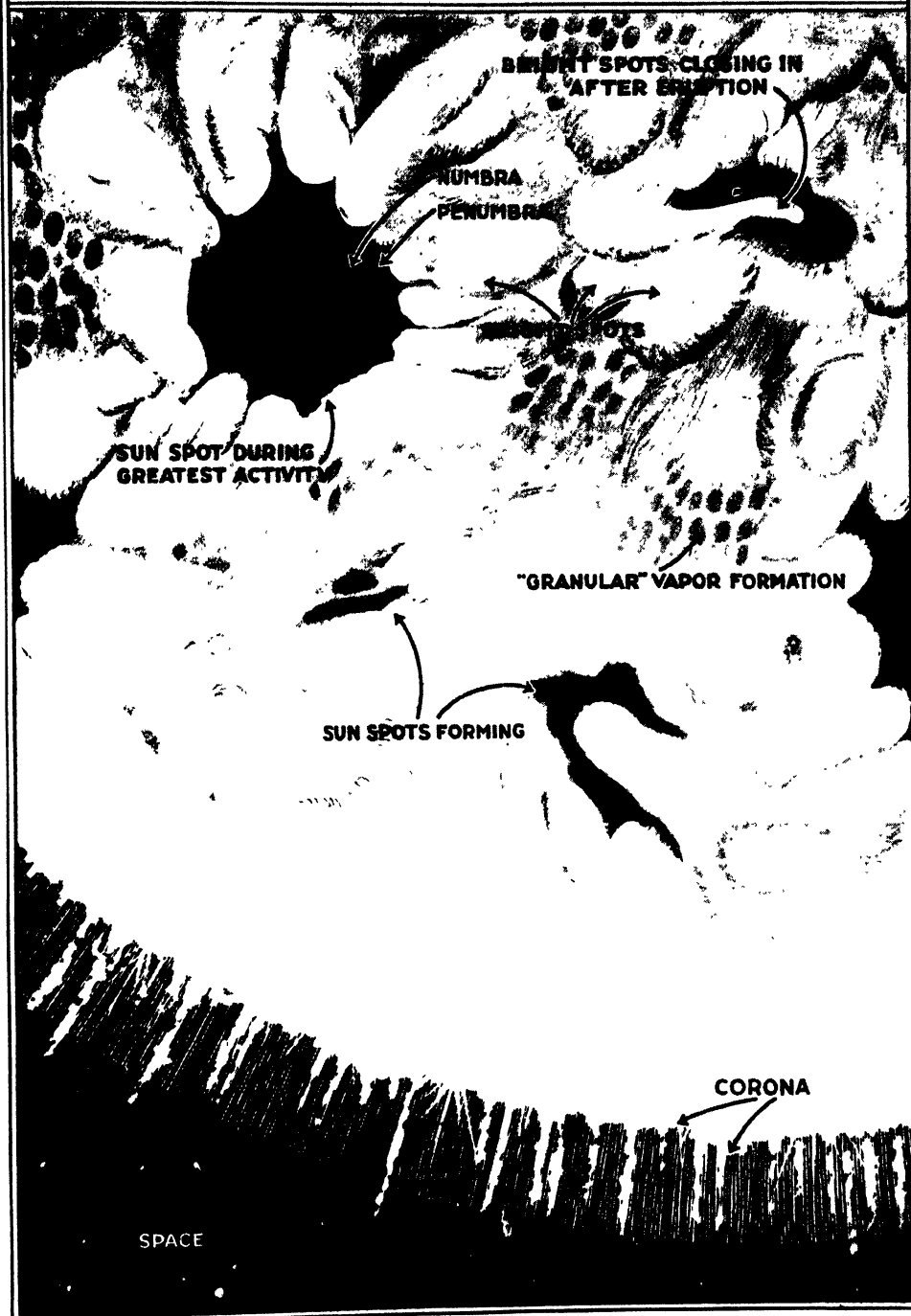
Composition and Heat of the Sun. What is behind the photosphere and the chromosphere, what the sun consists of in its interior, is still more or less a matter of conjecture. If the sun is cooling, the process is so gradual as never

to have been in the slightest degree noted. Since the earth has been inhabited, there has been time for the sun to burn itself out, if its heat were maintained by ordinary combustion. It is now considered possible that its heat may be maintained by the conversion of its mass into heat. If this is the correct explanation, the sun still contains enough heat to supply the earth for many millions of millions of years (in this connection, see STAR).

In the gaseous mass composing the sun are present iron, titanium, calcium, manganese, nickel, cobalt, chromium, barium, sodium, magnesium, copper, hydrogen, zinc, cerium, strontium, helium, carbon, nitrogen, oxygen, silver, tin, and potassium; most of these are described in these volumes. The amount of heat received by the earth from the sun in a year would melt a covering of ice 124 feet thick all over the surface of the earth, and if the rays from the sun could be all concentrated upon a bridge of ice $2\frac{1}{2}$ miles thick, reaching from the earth to the sun, the heat would be sufficient to melt that bridge in one second. Only a very small portion of the heat radiated by the sun reaches the surface of the earth, and the effect of this is greatly modified by the so-called "greenhouse effect" of the earth's atmosphere, which enables it to retain considerable of this heat. If the same face of the earth were always turned toward the sun, one-half would be always in the light and heat, the other half in perpetual darkness and cold.

Sun Spots. The surface of the sun appears to be dotted with dark patches, irregular in shape and varying in diameter from 1,000 to 50,000 miles. These are called *sun spots*, and it is observed that they become more numerous at regularly recurring intervals. Although apparently dark, sun spots are dark only in comparison with the rest of the sun's surface. In reality, the light of even the darkest of sun spots far exceeds limelight in brilliance. The brightest part of an electric arc light is the nearest approach to the light of the sun, but even that is not one-quarter as bright as the solar surface. It is, of course, quite impossible to examine sun spots with the naked eye. Col-

The FACE of the SUN



ored or smoked glass screens should be used, to prevent the glare from damaging the eyes. The Carothers Observatory, Houston, Tex., has suggested the following method:

If images of the sun be formed through clean-cut, round holes of proper size in a darkened room, at sufficient distance from the aperture, and cast upon white paper or cardboard, sun spots of ordinary size may be readily seen on the image.

This would enable amateurs to note the progress of the spots across the solar disk, and to compile interesting records. By observation of sun spots which pass round the sun, the time of the sun's rotation is calculated. The spots are apparently not attached to the sun's surface, but float about somewhat as clouds do in

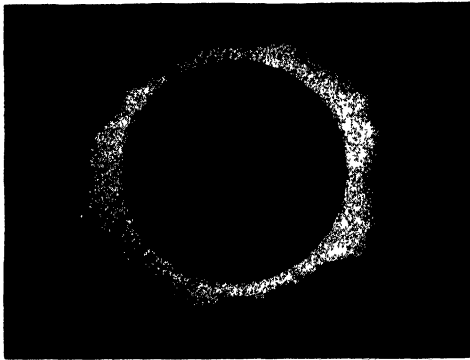


Photo: Visual Education Service

The irregularly luminous halo surrounding the sun can be seen and studied only during a total eclipse, and then for a period of from one to four minutes.

our atmosphere, causing differences in the calculated time of rotation, according to the latitudes on the sun at which the spots are located. Sun spots are believed to be vast whirling storms, something like tornadoes on earth, caused by the inflow of cooler gases from high levels. These spots are periodic in appearance, the average period being 11.1 years, but subject to variation. During the times of the greatest number of sun spots, called the maximum, from fifty to one hundred spots may be observed at once. Many weeks and even months may pass, however, without one being visible. A magnetic field exists in and about every sun spot, and it has been clearly established that, when the spots are most numerous, magnetic storms are frequent and violent on the earth. The majority of sun spots occur in pairs of opposite polarity.

It has also been determined that there are small fluctuations in the heat radiation of the sun, with accompanying changes in the light radiation, and much larger changes in the ultra-violet radiation, all apparently connected with the activity of sun spots. The sun, in fact, is a variable star.

Solar Photography. In solar observation, as in all other branches of astronomy, photography has proved of the utmost value. Special appliances and lenses are, of course, necessary, the photographs being taken instantaneously. The pictures obtained are usually from two to eight or ten inches in diameter, but some of the best have been enlarged up to forty inches in diameter. In observations of sun spots, photographs are particularly valuable, as they record the position and shape of the spots exactly as they were at the instant of exposure, and not as they might *appear* to the human eye. The Carnegie Observatory, on Mount Wilson, near Pasadena, Calif., is the best-equipped observatory in the world for the study and photographing of the sun.

The Corona. The corona, one of the most remarkable of nature's phenomena, is visible only during the total eclipses, and then only for a very few minutes at most. It composes the outer envelope, crown, or halo, of the sun. The inner portion of the corona is intensely bright and dazzling, tapering in the outer corona to a soft, filmy light, with streamers spreading millions of miles into space. Photography has been the means of reproducing the corona as it is, not as it appears to the artistic observer.

Sunrise and Sunset Colors. The light from the sun, which we call *white light*, is really a combination of several different colors, and it appears white because all of the component colors act simultaneously on the eye. At sunrise and sunset, we are accustomed to see pearl, red, gold, pink, and other beautiful colors in the sky. These lovely hues are the result of the breaking-up of white rays, as they pass through the denser and dustier reaches of the atmosphere, with its clouds and masses of vapor near the horizon. This causes the white rays to be separated into their component colors. The longest rays—yellow, orange, and red—are the ones that most readily pass through the dispersing particles and objects, and they throw a brilliant picture on the sky. Dust particles are a principal cause of the dispersion of sunlight. See, also, **COLOR.**

F.B.L.

The Sun in Literature and Religion. Literature of all ages contains strongly phrased reference to the sun and sun worship, though poets have sung more of the moon than of the sun. Among all savage nations, the sun has always been regarded as a god and worshiped with great ceremony. In the Teutonic language, the sun is feminine, being spoken of as *she*, while the moon is *he*. The Bible contains many allusions to the sun; Joshua commanded the sun to stand still and the moon to stay its course (*Joshua* x, 12). Some of the kings of Judah and Israel favored the worship of the sun, as practiced by the heathen dwelling round about them (*II Kings* xxiii, 5). Sun worship is still adhered to in India and China, and has only recently been abandoned among the Indians of North America.

In the famous *Bedouin Love Song*, by Bayard Taylor, the following lines occur:

Till the sun grows cold
And the stars are old.

Byron thus addresses the sun in virile figure of speech:

Thou material God!
And representative of the Unknown
Who chose thee for his shadow. Thou chief star!

An expression that has become a classic of brevity throughout the world is the practical philosophy of Cervantes, author of *Don Quixote*, who advises in homely figure to "make hay while the sun shines."

Related Subjects. The following articles in these volumes will give further information on the subject of the sun:

Astronomy	Precession of the
Corona	Equinoxes
Earth	Satellite
Eclipse	Solar System
Ecliptic	Solstice
Equinox	Star
Gravitation	Sun Dance
Nebular Hypothesis	Sundial
Planet	Sunstroke

SUNAPEE, sun' a pe, LAKE. See NEW HAMPSHIRE (Rivers and Lakes).

SUN BATHS. See HELIOTHERAPY.

SUNBIRD, the common name of a group of tiny tropical birds of Asia and Africa. They correspond to the humming birds of the New World, which they resemble in size and in the gay color of the male plumage. They are not so small as the humming birds, however, and their bills are curved instead of being straight. While they feed to some extent on flower nectar, their fare consists chiefly of the tiny insects that frequent the flowers. The sunbirds belong to the family *Nectariniidae*. D.L.

SUNBURY, PA. See PENNSYLVANIA (back of map).

SUNDA ISLANDS, two groups of islands in the East Indian Archipelago, extending from the Malay Peninsula to the Moluccas. Within recent years, the name has been less used, and is gradually disappearing. The Great Sunda Islands consist of Sumatra, Java, Borneo, Celebes, Banka, and Billiton; the Little Sunda Islands are Bali, Lombok, Sumbawa, Flores, Sumba, and Timor. With the exception of part of Borneo, they are under Dutch rule. The islands are extremely productive, and carry on a large commerce in spices, fruits, copra, rice, coffee, cocoa, tobacco, and sugar.

Related Subjects. The following articles in these volumes will give further information on the Sunda Islands:

Borneo	Java
Celebes	Sumatra
East Indies, Dutch	

SUN DANCE, a religious ceremony once practiced by the Plains Indian tribes of North America, but now almost unknown. In most places, it has been suppressed by the United States government, because of the fearful tor-

tures that sometimes accompanied it. The ceremony was held once a year, in summer or early autumn, and usually lasted eight days, the first three or four days being devoted to preliminary rites. Each tribe had its special reason for organizing the dance, but it was always believed to benefit the tribe. Sometimes it was held in fulfillment of a vow made to the sun god. The members of the tribe would arrange their tepees around a central medicine lodge, with an opening toward the rising sun. Decorations covered the center pole, around which the participants, who were stripped and painted, danced. The rites accompanying the ceremony were often very elaborate, and in all cases they had a special meaning.

SUNDAY, among Christian nations the first day of the week, the day set apart for rest and public worship of the Deity. Among the old Teutonic peoples, it was originally sacred to the sun, and its name has remained unchanged. Among the Latin nations, however, it became known as the Lord's Day, *dies dominicus*, from which the modern names *dimanche* (French), *domingo* (Italian), *domenica* (Spanish), etc., are derived.

In the earliest days of the Christian Era, the status of the Christians was such that they had to work every day in the week, and there is no evidence that Sunday was at first regarded as a day of general rest. It was, however, set apart for worship. About the middle of the second century, the Church fathers began to discuss the question of forbidding work on Sunday, but it was not until the fourth century that Church and State officially recognized

the day as a day of rest. Some of the states of the Union have laws regulating or prohibiting Sunday labor, and a few regulate Sunday amusements. See BLUE LAWS; WEEK.

SUNDAY, WILLIAM ASHLEY (1863-), an evangelist and former baseball player, known throughout the United States as "Billy" Sunday. He was born in Ames, Ia., a posthumous child, for his father was killed in the War of Secession, before William was born. A part of his childhood was spent in a soldiers' home; then he went to high school and to Northwestern University for a time. From 1883 until 1890, he played baseball on the Chicago, Pittsburgh, and Philadelphia teams of the National League.



Photo: Brown Bros.

WILLIAM A. SUNDAY

After his conversion, about 1890, Sunday served as assistant secretary of the Y. M. C. A. in Chicago, and then began his evangelistic work. In 1903 he was ordained a Presbyterian minister. He began to preach the gospel of clean living, and by his evangelistic revivals won followers by the thousands. Although his speech is slangy and crude, it is not vulgar.

SUNDAY SCHOOLS, once best known as **BIBLE SCHOOLS** in Europe, are instituted in connection with churches for the encouragement of Bible study, especially among young people. They are the outgrowth of a movement that began late in the eighteenth century, and are hardly older than the American republic.

The movement was inaugurated by a benevolent publisher of Gloucester, England, named Robert Raikes (which see). Moved by the forlorn condition of the children of the poor in his town, he conceived the idea of gathering them together on Sundays and of hiring women to teach them. His first so-called "Ragged School" was started in 1780. The interest shown by the children, and the good accomplished, more than justified the experiment, and when such workers as John Wesley and George Whitefield, and even the queen herself, gave their support to the work, the movement spread rapidly. When Raikes died, in 1811, there were about 400,000 children in Sunday schools. To-day, the Sunday schools enroll over 33,000,000 students.

In America, the Methodists began the organization of Sunday schools on a definite plan soon after the Revolutionary War, and other denominations followed their example. In 1824 a voluntary union of Christian workers of different denominations was organized in Philadelphia, under the name of the American Sunday School Union. Through missionary workers, sent to all parts of the United States, this organization established thousands of schools.

In the year 1872, American Sunday schools of all denominations began using a uniform system of lessons, designed to complete the study of the Bible in six years. This movement became international in 1875, and in 1889 it became world-wide. The organization which publishes the lessons is known as the International Sunday School Association. In recent years, the need of a graded system of lessons has been felt, and in many Sunday schools this idea has been successfully carried out. A well-organized school is divided into different departments, each having its own superintendent. The pupils are arranged into classes according to age and mental capacities, much as in the secular schools, and each department has a course of lessons especially adapted to the pupils of that division. Other features of modern Sunday-school work are classes for teach-

ers, Sunday-school workers' institutes, conventions, and circulating libraries.

Religious instruction in the Roman Catholic Church is given to all children who attend the parochial schools, and those who do not attend them are required to attend Sunday classes.

SUNDERLAND, ENGLAND. See **ENGLAND** (The Cities).

SUNDEW, *sun' du*. The sundews are a genus of interesting bog and marsh plants belonging to a class of plants that entrap and



Photo: Visual Education Service

THE SUNDEW

digest insects (see **CARNIVOROUS PLANTS**). The name refers to drops of sticky fluid secreted by glands on the leaves; in the sunlight, these glitter like drops of dew. The *round-leaved sundew*, which is distributed in moist places over the northern part of the United States, and from Labrador to Alaska, is a representative species. The slender stem of this plant, often about five inches in height, is topped by small white flowers occurring in rows, while at the base of the stalk, springing from the root, is a rosette of rounded leaves. The upper surface of each leaf is covered with gland-bearing hairs, each gland being the center of a drop of the sticky liquid. When an insect alights on a leaf, it becomes entangled in the fluid, the filaments with which it is in contact bend, and the victim is passed from one set of hairs to the next, as the leaf curls in, until the captive is in the center of a cup-shaped receptacle. Here it is drowned in the secretion, and portions of its body are subsequently digested and absorbed. **B.M.D.**

Scientific Names. The sundews form the genus *Drosera* in the family *Droseraceae*. The round-leaved species is *D. rotundifolia*.

SUNDIAL, the oldest device known for the measurement of time. The earliest mention of it is in the Bible (*Isaiah xxxviii*, 8):

Behold, I will bring again the shadow of the degrees, which is gone down in the sundial of Ahaz, ten degrees backward.

The probable date of the sundial above referred to is about 700 B.C. The earliest sundial of whose construction there is certain knowledge is the dial of Berossus, a Chaldean astronomer who lived about 300 B.C. This dial was a hollow hemisphere, set with its rim horizontal, and with a small bead fixed at the center. The shadow of the bead, during the sun's progress from east to west, described a circular arc. This arc was divided into twelve equal parts. The dial, as a consequence, divided the day, from sunrise to sunset, into twelve equal parts, which were called *temporary hours*, for their length varied with the seasons.

About the year 1400, the introduction of clocks and other mechanical devices for measuring time made necessary the determination of *equal hours*. By the end of the eighteenth century, the use of sundials was practically discontinued, though many still serve as ornaments or are preserved as relics.

A sundial is composed of two parts, the *dial face*, or *plane*, and the *stile*, or *gnomon*. The dial face is divided into quarters, and the dial must be set so that the dividing lines run toward the four points of the compass. The dial is further marked into hour spaces, with divisions of halves and quarters. The gnomon is a flat piece of metal, set in the center of the dial and pointing toward the North Pole. On sundials used in the southern hemisphere, the gnomon must point to the South Pole. See illustration, page 6928.

SUNFISH. There are several kinds of fish to which this name is applied. In North America, the sunfish are a group of small, bright-colored food fish, rarely over ten inches long. An interesting fact in regard to their coloration is that it changes according to conditions of health, food, and temperature. The *common sunfish*, or *sunny*, is found abundantly in brooks and ponds from Maine to Florida, and in the northern part of the Mississippi Valley. It has a roundish body and there is considerable orange in its coloration, so that the name given it by young anglers—"pumpkin seed"—is very appropriate. This fish is about eight inches long and weighs from six to eight ounces. Boys enjoy angling for it, because it bites with so much vim. Other species are the *red-spotted*, *long-eared*, and *copper-nosed*.

The name sunfish is also given to a group of grotesque-appearing ocean fish which have the habit of resting on the surface in sunny weather, with one fin above the water. The body is scaleless, dull-colored, and clumsy, that of one species seeming to consist of one great head

with small fins. They may weigh as much as 250 pounds. Ocean sunfish are never used as food. The fresh-water and marine sunfishes are not closely related; they belong to different suborders. L.H.

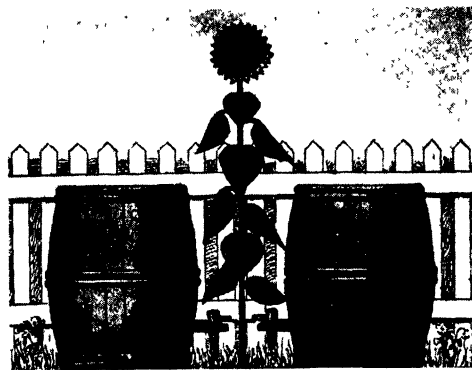


THE SUNFISH

The male is guarding the typical circular nest.

Scientific Names. The "pumpkin-seed" is *Eupomotis gibbosus*. The red-spotted, long-eared, and copper-nosed sunfish are species of the genus *Lepomis*. Ocean sunfish belong to the family *Molidae*. The common Atlantic species is *Mola mola*.

SUNFLOWER, a flowering plant of the composite family, so named because of the great flower head, with its encircling rays of



SUNFLOWERS REQUIRE MUCH MOISTURE

Each plant, in order to reach its fullest possible growth, must have two barrels of water to nourish it.

gorgeous yellow petals. James Montgomery's poem to the flower contains these lines:

Eagle of flowers! I see thee stand,
And on the sun's noon-glory gaze;
With eye like his, thy lids expand,
And fringe their disc with golden rays.

One of the best-known of several species is the annual garden sunflower, which under cultivation bears flower heads a foot in diameter. These heads are flattened discs, surrounded by circles of florets. The outer circle in each head is a row of large, yellow petals which seem al-



Photo: Wide World

A Very Interesting Sundial. This device is declared to tell the approximately correct time in all the principal cities of the world during their daytime periods. Those shown in deep shadow are in the dead of night.

6928

The dial stands in Druid Hill Park, Baltimore. (See article, page 6927.)

ways to be turned toward the sun, and from it to draw their bright color. The other florets, which form row after row of concentric circles, are small, tubular flowers. The plant has a rough, hairy stem from six to ten feet high, and coarse, heart-shaped leaves. Numerous leaflike bracts surround the disc, thus functioning to protect the more delicate parts of the flower.



... the sunflower turns on her god, when he sets,
The same look which she turned when he rose.

—MOORE: *Believe Me, If All Those*
Endearing Young Charms.

Some of the perennial species are excellent plants to cover walls and fences. Sunflowers are also grown for their seeds, which are used as food for cattle and poultry. In some sections of Europe, the stalks are used as fuel and the seeds are eaten as nuts. Of more recent date is the use of the plants for silage crops. B.M.D.

Scientific Names. Sunflowers belong to the family *Compositae*. The common annual species is *Helianthus annuus*. Among the decorative perennials are *H. orgyalis* and *H. decapetalus*.

SUNFLOWER RIVER. See MISSISSIPPI (Physical Features).

SUNFLOWER STATE, one of the popular names applied to Kansas (which see).

SUN MOTOR. See SOLAR ENGINE.

SUNNITES. See MOHAMMEDANISM.

SUNNY. See SUNFISH.

SUNSET STATE, a popular name applied to Arizona (which see).

SUNSHINE STATE, a popular name applied to South Dakota (which see).

SUN SPOTS. See SUN (Composition and Heat).

SUNSTROKE. This term has been applied to two different ailments resulting from overheating of the body. As the remedies for these ailments are entirely different, they should be very carefully distinguished. The more serious condition is known also as *heat stroke* and *heat fever*. It usually comes on quickly. The victim has a sense of burning heat all over the body; he becomes dizzy, cannot see clearly, and grows nauseated and faint; then he falls unconscious. The skin becomes burning hot and red, and there may be delirium, vomiting, and diarrhoea. The temperature will rise to 108° or more, in some cases as high as 115°. Such strokes may attack persons who have not been in the sun at all, but who are shut in hot rooms where the air has become foul.

The first thing to be done with a victim of sunstroke is to cool the body, by putting the subject in a cold bath or wrapping him in cold, wet sheets. Ice may be applied to the head or body or both. The application of cold must be continued until the temperature, as taken by a thermometer in the rectum, falls to 102° and remains below that level. The use of electric fans is of service, in both heat stroke and heat exhaustion. Water may be given, but under no circumstances should any stimulant be administered, as stimulants warm the body. It is always wise to call a physician, but if one cannot be found, no time should be lost in getting the victim cooled. Should a boy on a fishing expedition in the woods suffer from heat stroke, his companions should roll him in the river without delay.

Deaths from sunstroke are numerous in large cities during very hot spells, but many fatalities would be prevented if people would be more careful about eating and drinking. Excesses of any kind should be avoided, but indulgence in alcoholic liquors, especially.

Heat Exhaustion. This is the term which is applied to the milder ailment. In this case, the pulse becomes feeble, and the patient feels exhausted and is faint, but is not necessarily prostrated. The skin, instead of becoming burning red, is white and clammy. If the attack is severe, the subject will lose consciousness, and the temperature will fall below normal, perhaps to 95°. Recovery, however, is usually a matter of a short time, the chief remedies being rest and stimulation. Cold is never applied externally, except that a cold cloth may be placed on the head. Tea, coffee, or aromatic spirits of ammonia should be administered, or, if nothing else is at hand, a small quantity of whisky or brandy in a large quantity of water. If the case is unusually bad, a warm bath may be given. W.A.E.

SUN YAT-SEN, DR. (1867-1925), leader of the Young China party, and first President of the Chinese Republic. Dr. Sun was born in Kwangtung province, of native Christian parents. After his graduation from the College of Medicine at Hong Kong, he practiced his



Photo: Wide World

SUN YAT-SEN AND HIS WIFE

Since the death of the great leader of the Young China party, Mrs. Sun Yat-Sen has been almost idolized by the people.

profession at Canton, but soon showed more interest in politics than in medicine. From 1895 until after the revolution of 1911, he was an exile because of his connection with an attempted revolt.

In 1912, less than two months after his election as provisional President, Dr. Sun relinquished his office to Yuan Shih-Kai, in the interests of harmony in the new republic. Differences between the two leaders increased, but in 1916 Yuan died, and the following year Dr. Sun declared himself the head of South China, a newly formed republic, although he did not retain the position long. In 1921, however, he was recalled, but again his inability to cooperate, and his feverish ambition, which urged him to expand into Northern China before his work in South China was well established, caused him to be exiled. By 1923 he was able to muster sufficient military fol-

lowing to return, and he remained chief executive of the province of Kwangtung until his death. In 1929 his body was interred in an elaborate memorial building in Nanking. See CHINA (History).

SUPERHETERODYNE. See RADIO COMMUNICATION (Glossary of Radio Terms).

SUPERIOR, LAKE, the largest body of fresh water in the world, and the deepest, most elevated, and most northwesterly of the five Great Lakes of North America. It lies between Ontario on the north and east, Wisconsin and Michigan on the south, and Minnesota and Ontario on the west. Its maximum length from east to west is 412 miles, and its greatest width is 167 miles; the area, 31,200 square miles, is a little greater than that of the state of South Carolina. Lake Superior has a maximum depth of 1,008 feet, and is 602 feet above sea level. About two hundred rivers pour their waters into it, the largest of which, the Saint Louis, at the western end, is the most remote headstream of the Saint Lawrence. Isle Royale (which see), about eight miles from the international boundary between the United States and Canada, is the largest of its islands and is a part of Michigan; others of importance are Saint Ignace, Grand, Manitou, and the Apostle group.

Lake Superior, for the most part, has a bold and rocky coast line. In some places, especially on the north shore, there are steep cliffs rising abruptly from the water's edge to heights of several hundred feet; the Michigan shore is diversified by the famous sandstone walls known as the Pictured Rocks. The lake basin is a huge rift in a region rich in copper, iron, nickel, and other ores. The waters of the lake



LAKE SUPERIOR

The small corner map shows the location of Superior with respect to other members of the group of Great Lakes.

are unusually pure, and they abound in whitefish, sturgeon, and trout. Because of its depth, the lake never freezes over, though ice forms along its border and in the bays.

This fresh-water lake is an important link in the greatest water highway of North America. It discharges at the eastern end into Lake Huron, by way of the Saint Mary's River. There is a difference of over twenty feet in the levels of the two lakes, and at the drop from Lake

Superior to the river, where there is an impassable series of rapids, there have been built the famous locks of the Sault Sainte Marie Canals. One may travel by water from Duluth, at the western end of Lake Superior, to the Atlantic Ocean. The chief cities on the lake are Duluth and Superior, Minn.; Marquette, Mich.; Ashland, Wis.; and Fort William and Port Arthur, Canada.

Related Subjects. See GREAT LAKES, for chart showing comparisons of the five Great Lakes with respect to size, elevation, and depth. See, also, SAULT SAINTE MARIE CANALS.

SUPERIOR, WIS. See WISCONSIN (back of map).

SUPERLATIVE DEGREE. See COMPARISON.

SUPERMAN, THE. See NIETZSCHE, FRIEDRICH WILHELM.

SUPERNATURAL. See OCCULT.

SUPERNATURALISM, in religion, the belief that there is an agency above the natural. It is based on man's instinct to look to a power higher than himself for care and direction, an expression of which is found, for example, in the words of the Greek poet Homer:

As young birds ope the mouth for food,
So all men need the gods.

An example of modern supernaturalism is the acceptance of the revelation and miracles of the Bible. It is opposed by *rationalism* (which see).

SUPERSTITION, *su pur stish' un*. Superstition represents a phase in the history of thinking. The most difficult art that man has had to learn is the art of reasoning. He has learned it very slowly, very imperfectly. Primitive habits of thought, childlike inclinations to believe, yet persist; such tendencies are responsible for the continuance of superstition. The contrast to, and the remedy for, superstitious thinking is scientific thinking. In these days of general education, every one knows a considerable mass of facts and of the relations of cause and effect, which science has established by observation, proof, and insight into principles or laws of nature. Every one's mind has been drilled and formed by some measure of scientific thinking. But outside this limited range—and even within it—all sorts of notions are held which are more closely related to superstition than to science.

Among the relatively uneducated masses, the tendency to cling to the earlier, simpler habits of belief is strong; it was far stronger when education was confined to the elect, and even they were imperfectly freed from unscientific notions and practices. Because science has illuminated so fully the facts of physics and chemistry, of biology, physiology, and the rest, and initiated men into the scientific point of view, the outgrown beliefs and

systems of past ages seem strange, and the practices curious and absurd. But in milder form, in less serious directions, we may sympathize with the feelings that led to such beliefs and practices. Superstitions reflect an attitude of mind, a way of thinking about the happenings and relations of the world; that mental habit—pernicious at worst, uncritical at the best—plays an important part in the regulation of human conduct.

The Strange and Unknown. A reason or explanation satisfies curiosity, but its more practical end is to guide conduct. The strange, the unknown, induces fear and uneasiness. Understanding makes for mental adjustment. As events are understood, man becomes at home in the world of happenings; he anticipates, prepares, and in some measure controls his fate. But his questionings go beyond this immediate purpose; his curiosity is always asking: Why? The history of early science and of superstition shows what kinds of answers were satisfactory in the childhood of the race.

Foretelling the Future. The most general interest of inquiry is to read the signs of events and foretell the future. Such foresight or insight was regarded in primitive communities as a gift, a privilege of the elect; the predecessor of the man of learning was the priest, medicine man, soothsayer, and wonder-worker. He professed to know the ways of nature and the mystic forces that control destiny, including, especially, the spirit forces which all primitive religions recognize. In more established societies, he may be, like Joseph, an interpreter of dreams; for dreams come from the unseen world and bear upon the personal fate of the dreamer. The Romans had professional augurs; by the flight of birds, or by the appearance of the entrails of sacrificed animals, by omens of sky, and by everyday incidents, they decided when the signs were favorable for battle, for alliances, expeditions, or the personal fortune of king or leader. The Delphic oracle and the Cumaean sibyl illustrate the religious aspect of this function; for science and religion develop together, just as, in primitive societies, the priest, the wise man, and the diviner are one. Through him as a medium, the gods are implored to prevent storms or plagues, to bring good crops and successful enterprises. There may be an alliance with evil spirits as well as good ones; the sorcerer's power may be feared as well as respected. He has to do with the reading of omens, the telling of fortunes, the preparation of charms, the cure of disease, and the protection against enemies. The world in which he exercises his art is dominated more by fears than by hopes, for unseen dangers and evil spirits are constantly threatening. The reading of signs and control of fate by charms and countercharms most amply illustrate the setting in which

superstitions flourish. The tendency to believe and to be influenced by such practices is the superstitious bent. In surveying the varieties of superstition, we may observe the *motives* that prompt belief—always some strong desire or fear; the *means*, that is, the practice followed, usually in relation to a set of principles or a system of interpretation; and the *basis*, in observation of reasoning that supports it. Thus viewed, superstitions, though fanciful, cease to be arbitrary, and often acquire an interesting history; they become specimens in the museum of thinking.

Ascribing Motives to Nature. Underlying the notion that gave rise to the practices of divination and magic is the belief that events occur for their personal significance. The outer world and its happenings are interpreted in human terms. Nature is supposed to act with motives similar to human motives. A storm is thus regarded as the revenge of an offended god; a plague is a dire punishment for transgression of some sort; success will be the reward of generous sacrifices; and good luck will result from the observance of minute prescriptions. Still more generally is the setting of nature interpreted as bearing upon personal ventures and fortune. In this type of reaction to their environment, men have found the sky the most impressive object of contemplation; it becomes the symbol of the great beyond and the dwelling place of the mighty powers that control. It invites worship and awe. The sun, moon, and stars, with their regular, yet mysterious, changes; clouds, rain, wind, lightning, thunder; night and day, seasons, weather—these condition human enterprises. Out of this close relation arose the oldest of the sciences (astronomy) and the most widespread of superstitions. It should be proper to speak of all such notions as *astrological*, though astrology refers usually to the system in its elaborate form, as practiced from ancient times to within a few centuries. The notion that the stars are connected with human destiny is the underlying one. The heavenly light of a star in legend is associated with the birth of Confucius, as well as of Moses and of Jesus, with the birth of the Caesars of Rome or the mighty of the earth; Napoleon seems to have had a sincere belief in his star of destiny. No less astrological is the belief that, when momentous human events are to occur, portents are seen in the sky as on earth; when Rome was threatened, the earth trembled, volcanoes broke forth, lightning bolts flashed, the heavens were obscured. In some minds, a comet still strikes dismay, as a sign that the end of the earth is approaching.

The Horoscope. Astrology shows the close relation of science and superstition. Important facts relating to the sun and moon, the stars and planets, were gathered under the

motive of studying the celestial influences upon human life. Only three hundred years ago, Kepler, the most scientific astronomer of his day, practiced astrology. Though he spoke of astrology as the foolish daughter of a wise mother (astronomy), he had a measure of faith in the horoscopes which he cast, and by which he earned his living. Astrology is a system of divination (which see) requiring astronomical data; the horoscope which predicts the fortune of the individual, by reference to the position of the heavens at the time of birth, is the most elaborate product of superstition that the human mind has devised.

It is not easy for our minds to follow or state its basis. We can understand the exercise of the imagination by which the planets, stars, and constellations received names; these names were those of the gods of mythology, who in turn were accredited with certain powers and attributes. Again, some of the constellations were named in fancied resemblance of their outlines to the shapes of animals, and these animals, too, have qualities. Also, the movements of the heavenly bodies bring about changes of position—rising and setting, opposition, and conjunction. Out of this elaborate set of relations, a zodiac is formed and prediction begins. Mars is the name of a planet and of the god of war; Venus is the name of another, and of the goddess of love. Jupiter has one disposition, and Saturn another. Consequently, according to this system, a child born under the ascendancy of Mars will be violent and pugnacious; one under the dominance of Venus will be given to ardent love affairs; those at whose hour of birth Jupiter presided will be jovial (for *jovial*, derived from *Jove—Jupiter*—is an astrological word); and those with like relation to Saturn will be saturnine, or morose and gloomy in disposition. "A child born under the sign of the *lion* will be courageous, but one under the *crab* will not go forward in life; one born under the *water-man* (aquarius) will be drowned"; and so on. All this was believed merely because the arrangement of certain stars suggested the shape of a lion, and the lion is a bold, courageous beast; another, the shape of a crab, which has the habit of walking backward; a third, that of a water carrier, and in water one may drown. No other attempt—at least none with so ancient and influential a history—to bring together in the way of cause and effect the most remote happenings and relations, is quite so far-fetched and extravagant. But that kind of reasoning underlies many systematized superstitions and loose beliefs. Such argument is called an analogy, in this instance a most feeble, remote, and fanciful one. Pretentious systems like astrology may be called pseudo-sciences, because they attempt to build up a body of doctrine after the manner of a science,

upon a basis that is entirely, or largely, akin to superstition.

Everyday Superstitions—Survivals of Astrology. Survivals of astrological notions appear in such practices as planting potatoes or cutting hair when the moon is waxing; the analogy being that, as the moon grows, so will the potatoes or the hair. Conversely, alders and undergrowth, and anything that one wishes to be rid of, should be cut when the moon is on the wane, so that, as the moon disappears, so will they. The pathetic incident of Barkis going out with the tide reflects a like notion of sympathy between human life and the movements of nature. This manner of connection or sympathy or analogy—or however we describe the slight, fanciful, remote bond—extends to many details. Religious processions must follow the direction of the sun (from east to west), and never the reverse. In stirring batter for bread, or in churning butter, the motion must be sunwise. Reversing the direction will spoil the result or invite bad luck. Such reversal is itself an apt instance of analogy as it prevails in superstitious thinking. A reversal of a normal direction becomes unholy or unlucky. Since right-handedness is the normal relation, something of the weird or prohibited attaches to the left. *Sinister* means, literally, *left*, but has the secondary meaning of suspicious or of bad omen. A reference to the left shoulder reverses the meaning, or averts the consequences of a falsehood; or, by the value attaching to the unusual, the left hind foot of a rabbit becomes a charm, or one must see the new moon over the *left* shoulder, and with silver in one's pocket, to insure good luck. Superstition tends to become ever more detailed and determined. Every minute practice and circumstance carries some slight measure of good or ill luck. The choice of food, of dress, the conduct of the chase, of war, of sowing and reaping, are all regulated minutely; for superstition invests trivial circumstances with significance and weaves a close web of regulation—of what to do and what not to do—that hampers action and fetters the mind. Science liberates, while superstition enslaves.

The notion of sympathy or, in another form, correspondence, is prominent in magic; it is recognized as sympathetic magic. The common form of the practice is for working ill, casting a spell, or bewitching. Some primitive people hardly attain to the notion of a natural death; death is either the obvious consequence of a violent injury, or to be accounted for as an obscure, magical influence. The sorcerer *wishing* the death of a victim makes a crude image of the person, or obtains a lock of his hair, the parings of his finger nails, an article of clothing, or dedicates some object to represent the victim; he then sticks thorns into the image, burns it, buries it, tortures it, pro-

nounces incantations upon it, in the belief that all these evils will happen to the enemy. In a trial for witchcraft in 1618, two women were executed at Lincoln for burying the glove of Henry Lord Rosse, so that "as that glove did rot and waste, so did the liver of said lord rot and waste." Such is sympathetic magic.



HOW TO DESTROY AN ENEMY BY PROXY

A sorceress sells an effigy of the enemy to the person who is seeking revenge. The effigy is then stuck full of pins and otherwise tormented until the person it represents dies. It is hard to believe in this enlightened age that such a superstition ever could have swayed the hearts and minds of men.

Protection by Charms. The two notions that disaster may be transferred by wishing evil, and that some persons have peculiar magical powers, unite in the belief in the "evil eye," which is widespread in the Orient and from there invaded Italy. By some peculiarity of appearance or manner, certain persons of low or high degree get the reputation of possessing the evil eye. Hence all sorts of countercharms are devised to offset the deadly glance. (It is interesting to note that we still call any trinket, such as is carried on a watch chain, a *charm*, but accept it merely as an ornament; yet these sometimes carry a device suggestive of the old meaning.) The charm may be in the form of a prayer written on paper, or a formula, or a metal or stone; the bits of mirror worked into Oriental embroideries carry the tradition of being such countercharms.

Any holy object or relic may be used as a charm, as by like power it may cure disease. Some are protections against definite ills, such

as shipwreck (this is true of some of the tattoo marks of sailors), or smallpox, or violent death. Others indicate a protection against the entry of evil spirits. The horseshoe nailed over the door is a familiar example. It survives as a general symbol of good luck, but carries mainly the notion of protection to a house. About it are gathered minute ceremonies. In the Spree-wald (Germany), the finder of a horseshoe must at once return to his house without speaking to anyone (for speaking breaks the charm; similarly, when children *wish* on the first star that appears at evening, they wait to be spoken to before speaking); he must hang it over the door with the prongs up (for if hung the other way, the luck will fall out); it must be nailed with three nails and three blows of the hammer (mystic power of *three*, probably derived from the Trinity). (If a maiden finds a horseshoe and it has nails in it, the number of the nails indicates the number of years before she will be married; another example of the doctrine of signs.)

The origin of the horseshoe tradition is not clear. It belongs to modern rather than to the most ancient folklore. The virtue may lie in the shape, in the metal, in the association with the horse. The fact that we cannot readily determine the basis of its choice shows how far we have grown away from the type of thinking that gave it peculiar power. It is also a good example of the type of logic that is sufficient to establish a belief. There is no proof of relation between a horseshoe and good fortune. Favorable cases are noted, and unfavorable ones neglected or explained away as due to lack of proper ceremonies or the bad character of the persons concerned.

A word should be said concerning the use of names as charms, and the importance of formula in incantations. The primitive idea regards the name and the person as closely connected; true names may be concealed, lest by their use one may be bewitched. Holy names must not be spoken. The custom of "taboo" thus arises. But, as in the tales of *Arabian Nights* the magic word brings the genie or opens the mystic door, so in the administering of drugs or the performing of rites to bring luck, mystic words are used; without the right words, the charm fails. Words are also countercharms, and if spoken at the proper moments, ward off evil. The notion is preserved in the common superstition of touching wood to prevent the happening of trouble that is mentioned. (The wood is by some referred to the symbol of the cross.) A traveler mentions that he was never in a railway accident, or a mother mentions that her children never had whooping cough; and at once touches or knocks on wood to prevent the mere mention of the misfortune from bringing it on. The Germans, under the same circumstance, say "Unberu-

fen," similarly to prevent the mere name or mention from bringing on the reality. The magic of names has a large history, in which remote notions of such connection are embodied (see MAGIC).

The Folklore of Salt. It is difficult to say why one article rather than another becomes the center of folklore superstition. The folklore of salt is a typical instance. It, too, is supposed to keep off spirits; and throwing a pinch of salt over the left shoulder is a ceremony that in some countries is a means of keeping the devil at a distance. The spilling of salt as a bad omen is widely current; it is commonly interpreted as the sign of a quarrel, possibly because the acceptance of salt indicated friendly hospitality. An example of sympathetic magic with salt is the following from the South of England. A maiden on three successive Friday nights throws a pinch of salt into the fire, and says:

"It is not this salt I wish to burn,
It is my lover's heart to turn;
That he may neither rest nor happy be,
Until he comes and speaks to me."

On the third night, she expects to see her lover. Note the number *three*, and the day Friday, commonly an unlucky day, but here chosen as propitious for magic.

Superstitions cumulate, old and new notions mingle, but all in the same vein. A Swiss peasant may be advised to fortify himself against evil spirits by carrying a piece of fresh bread in one coat pocket and a psalm book in the other; a piece of rock salt in each vest pocket or inside a briarwood cane upon which three crosses have been cut. A negress may carry a rosary and a rabbit's foot in the same pocket, for a double protection.

Driving Evil Spirits Out of the Body. The practice of medicine offers a favorable field for tracing the course of superstition. The early and widespread notion that disease is caused by the invasion of a foreign spirit comes from the days when priest and physician were one. Cure takes the form of exorcism. By weird ceremonies, the *shaman* or priestly medicine man attempts to drive or suck or frighten the spirit out of the afflicted body. The drum and the rattle, as well as a bag of herbs or magic odds and ends, are his insignia; the drum and the rattle are now the playthings of children. This notion is part of the more general one of the direct play of spirits (animism) in the forces of nature and the conditions of life. A dream is regarded as a real experience in which the soul of the sleeper takes an excursion to another world and brings back reports. Hence the practice of never awakening a sleeper, lest his soul fail to find its way back to the body. A like belief leads to the "ghost" or returning spirit—which plays a large part in superstition, and prepares the ground for such modern move-

ments as Spiritualism (which see)—to ancestor worship, or to the return of ancestors in the newborn child.

It may be interesting to trace some of the remote superstitious forms of such belief. Sneezing has always been regarded as an omen, in some cases as of supernatural origin. There is the feeble notion that a spirit is leaving the body in the sneeze; to turn it to good omen, the Italians say "Felicita" and the Germans "Gesundheit," thus wishing happiness and health. The spirit notion in seeking some visible expression has become attached to the image or reflection, which equally is involved in the personality. Hence the practice of covering mirrors at times of death or other occasions, of attaching a peculiarly bad omen to the breaking of a mirror; or, again, the objection of North American Indians, as of other people, to having their portraits or their photographs taken. This may be partly because the picture might be used for bewitchment, but is also because the sitter is parting with a portion of himself. The custom of naming children for ancestors is at once an intelligible sentiment and has a dim reference to an actual return; among some primitive people, the name is given according to the returned ancestor thus recognized. Oriental people will not name a child for a living relative. In such remote prejudices, we may recognize vestiges of ways of thinking that once determined the serious views of life.

Exorcism was practiced until within recent times. It was taken up by the Christian Church, and there used to cure disease and to rid haunted houses of their ghostly visitors, and against the damages caused by raids of animals, vermin, or plagues. In connection with the belief in the divine right of kings, the king's touch had peculiar power to cure scrofula. Particularly when the patient acted strangely, lost consciousness, foamed at the mouth, or raved in delirium, was the explanation of possession by a spirit resorted to. The term *epilepsy* means *seizure* and refers to the possession by a spirit (see WITCHCRAFT). The astrological notions invaded medicine and led to the belief in the moon as a cause of insanity, in deference to which notion we still use the word *lunacy* (from *luna*, the moon); and the belief prevails that sleeping in the moonlight is peculiarly dangerous. It is another phase of this belief that associated certain days with the medical practices. An ancient manuscript mentions twenty-eight days "which were revealed by the Angel Gabriel to good Joseph, which ever have been remarked to be very fortunate days, either to let blood, cure wounds, use merchandises, sow seed, build houses, or take journeys." (These good and bad days are really of Egyptian origin.) So medicines had to be taken at prescribed times and ceremonies. In such practice there is much room

for the operation of a mental attitude. The patient was impressed by the weird and minute prescriptions, and his confidence of benefit expected (see FAITH CURE) was doubtless more effective in many cases than the potion or operation. It was this confusion of scientific



THE KING'S MAGIC TOUCH

The "divine right of kings" meant more than that the king could do no wrong. It ascribed to him also the peculiar power to cure his subjects of "king's evil," or scrofula, by touching the head of the sufferer with his hand.

fact and superstitious belief that Voltaire satirized when he said that incantations, together with a sufficient amount of arsenic, would doubtless kill your neighbor's sheep.

To illustrate the mixture of science and superstition, the following may be cited from a letter of an M.D., of date 1581: "On Friday and Saturday, the sign will be in the heart; Monday and Tuesday in the stomach; during which time it will be no good to take your ordinary physic." (The different parts of the body were associated with the signs of the zodiac, as may still be seen in the picture of the human body and the astrological signs in an old-fashioned almanac.) In an almanac of 1571, one may read: "No part of a man's body ought to be touched with the Chirurgicall instruments or cauterie actual or potencial, when the Sunne or Moone or the Lord of the Ascendant is in the same signs that ruleth that part of the man's body."

Medical Superstitions. The principle of analogy is variously illustrated in medicine. On the side of cure, it appears in the doctrine of signature, by which eyebright (the flower having the appearance of an eye) is prescribed for eye trouble; walnuts (the shell like the skull, the kernel like the brain) for diseases of the brain; or in the practice of Chinese physicians to administer the tops, middles, and roots

draw rheumatism out of the body. When the magnet was relatively unknown, it was accredited with mystic powers; and European peasants carried one to avert and cure disease. Yet the faith is no different from that which leads credulous people to-day to pay handsomely for "electric" belts and similar fraudulent devices. (For the part that the magnet has played in allied practices, see HYPNOTISM.)

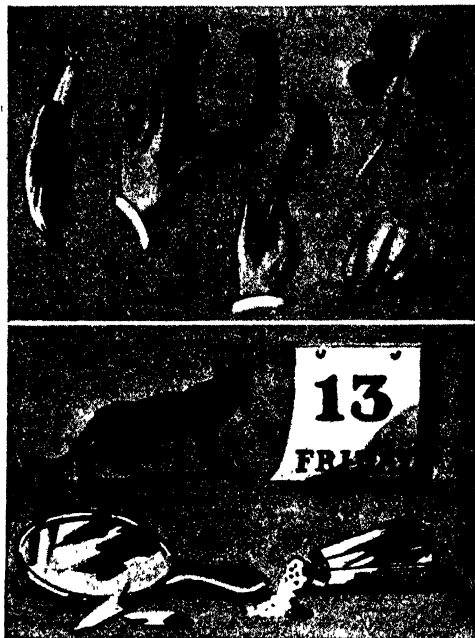
An interesting medical superstition, likewise with an ancient history, is the notion that unusual and uncanny objects will have powerful medical effects. The most nauseous concoctions were brewed as medicines. This practice is well preserved in the formula of the witches' caldron in *Macbeth*: "eye of newt, toe of frog, lizard's leg, scale of dragon, gullet of a shark, a tiger's entrails, slips of yew gathered in the eclipse of the moon," "root of hemlock, digged in the dark," "liver of blaspheming Jew," "nose of a Turk, and Tartar's lips," "finger of birth-strangled babe":

"Cool it with a baboon's blood,
Then the charm is firm and good."

Medical potions and charms (love potions or love philters particularly) were not clearly distinguished; and the drugs used, often combined with incantations or superstitious directions, were impressive because of the mystic setting in which they were prescribed.

Present-Day Superstitious Thought and Practice. The wide range of superstitious thought and practice may be further illustrated by a survey of current practices, sometimes followed with full belief in their virtue, more commonly in a playful half-belief not unmixed with a feeling that it is, on the whole, safer to conform. From 875 persons' (eighty per cent women, twenty per cent men), of ages sixteen to twenty-eight (students in two normal schools of California), there were obtained about 1,100 admissions of full belief in some superstition, about twice as many admissions of half-belief, and nearly four times as many disbeliefs. There were nearly as many who believed as who disbelieved in some form of luck, superstition, or sign.

Spilling salt is the sign of a quarrel; bubbles in the tea cup or an itching skin means visitors; a blister on the tongue means that you have told a lie; when four persons in shaking hands cross hands, it means a wedding; when your ears burn, someone is speaking of you; when you have the cold shivers, some one is walking on the spot that will be your grave; stepping on the cracks of paving stones means that you will fail in your lessons; giving a knife cuts friendship; breaking a mirror, walking under a ladder, postponing a wedding, opening an umbrella indoors, turning back on a journey, stubbing the toe, wearing clothes inside out, wearing a peacock feather, meeting a funeral,



TWO GROUPS OF OMENS

Above: Carrying a rabbit's foot, nailing a horseshoe above the door, finding a four-leaved clover, and picking up a pin are good omens in which many people yet believe. Below: A black cat crossing one's path, Friday the 13th, breaking a mirror, and spilling salt are regarded as evil omens even to-day by multitudes of people, regardless of abundant proof to the contrary.

of plants for diseases of the head, chest, and legs, respectively. The doctrine of sympathy was systematized in that country in the remarkable idea of treating not the wound but the weapon that inflicted it; as the salve was applied to the weapon, the wound would heal. The phrase "to take a hair of the dog that bit you" reflects the similar notion that, by means of the hair, one may cure the bite. Direct transfer is practiced by literally wishing or by contact, placing the diseases upon an animal or an object, and thus relieving the patient. Recent cases are reported in which children attacked by whooping cough were required to cough in the face of a live catfish, kept in a tub for that purpose. Similarly, by analogy, the fact that a loadstone will draw to it particles of iron has led to the belief that it will also



Photo: O R O C

SUPERSTITION CONNECTED WITH THE TORII GATE

Such a fantastic structure is usually placed before the entrance to some sacred place and also is seen in harbors and waterways. It is a belief of Japanese sailors that fair weather and success will attend them on a voyage if their craft is sailed beneath the lintels of the torii. Only very small boats can actually pass through the gate [A beautiful color plate of the torii gate appears in the article JAPAN.]

going out of a house through a window, sitting on a table, are all signs of bad luck; finding four-leaved clovers or horseshoes, picking up pins, returning part of money in payment, are signs of good luck. Add to these the avoidance of Friday for enterprises, the refusal to sit down if there are thirteen at table, the belief in dreams, and one has a fair notion of the great body of traditional folklore which has come down the ages and obtains more or less of a hold upon the growing minds of even the educated classes; incidentally, the attempt to see some kind of meaning or connection between sign and event requires an initiation into the byways of outgrown systems and the ways of primitive thinking.

As now current, these are fairly innocent superstitions, which interfere but slightly with the regulation of conduct by scientific thinking. That even slight belief affects conduct is shown by the fact that rooms in hotels, cabins in steamships, and houses on streets skip number thirteen or substitute twelve and one-half; that, until recently, steamers did not set sail on Friday; that some business men avoid transactions when the thirteenth of the month falls on a Friday; or even that a Thirteen Club exists in New York, formed of thirteen members, meeting for dinner on the thirteenth of the month at 7:13 o'clock, in order to defy this superstition.

Pseudo-Science—Mixture of Fact and Superstition. The effect of the belief or entertainment is quite different when transferred to the systems of interpretation of the pseudo-scientific type. These, too, show the mixed origin and reflect the history of superstition. Most flagrant is the practice of fortune-telling. It rests primarily upon the doctrine (or the pretense) of special powers, obtained by peculiarities of birth (the seventh son of a seventh son, born with a caul), or of association with a favored tribe (the gypsies), or occult learning (India), or of actual success in prediction, or possession of a system. Fortune-telling by cards (see DIVINATION) shows how readily chance combinations may be fitted to the ordinary run of human fate. But palmistry is the most typical, in that it reads personal fortune from personal features, not as physiognomy attempted to do, by observing what kinds of qualities are associated with features, but superstitiously, by attaching far-fetched consequences to minute variations in the creases of the palm. Physiognomy, like phrenology, is a pseudo-science, because its data are utterly inadequate, unreliable, and misinterpret the relations which they observe.

These attempt to build up knowledge after the manner of a science, but really depend upon prepossession, loose reasoning, and a hopeless kind of evidence. They are superstitious only

in that the underlying idea continues the search for *signs* of qualities of personal value in outer indications. Psychology as a science has shown how differently one must proceed to obtain such insight, and that any rough-and-ready diagnosis or reading of character, much less of fate or fortune, is essentially unscientific, as is the search for the elixir of life, the philosopher's stone, or the fountain of youth. The case of palmistry is much worse; it is plainly superstitious in spirit, in method, and in the kind of interpretation which it employs. The creases of the hand are adapted to use, and presumably had their origin in the apelike ancestors of the human race who dwelt in trees. To call one of the major creases "the line of life," and predict longevity or an early death from its variable length, is an utterly arbitrary procedure. The actual belief in such significance is quite on a par with the practice of savage tribes that put to death babes which their fortune-tellers decided were born at an evil hour. And yet so strong are these superstitious tendencies that fortune-tellers and palmists practice a suspicious if not entirely fraudulent trade in all the large American cities, and business men, as well as men and women of all classes, consult them on financial ventures, love affairs, and the critical enterprises of life.

Nothing could more pointedly illustrate the danger that lurks in a yielding to the superstitious habit, or permitting it to extend beyond the playful realm, where, as is true of myth and fairy tales and legends, it adds an innocent spice to adventures of human interest. Education insists that the mind's habits shall be formed by a scientific training, without stunting the imagination or neglecting the poetic and religious interpretation of life; for in all this there is illumination and progress. But superstition is stagnant and unprogressive; it is about the same in savage conditions, in the days of medieval darkness, and among the ignorant of all stages of civilization. Superstition survives somewhat naturally in those whose careers, like those of sailors, are constantly at the mercy of uncertain ventures; it may be for a like reason that gamblers, speculators, and others following venturesome forms of pursuits have a strong belief in luck and signs. Yet the more widespread tendency responsible for credulity is the inability to grasp the all-comprehensiveness of scientific thinking, and to cling to the suspicion that, outside this established realm of cause and effect, there is another type of influence, of an occult or hidden order, which now and again with a personal motive directs human fate. Inconsistent as it may be, the two tendencies manage to persist in a mind that in most affairs reacts scientifically, but keeps certain reserved areas for the exercise of the older type of beliefs. Such lapses or partial developments maintain superstitions

and the attempted revival, from time to time, of pseudo-scientific systems that are entirely out of keeping with the spirit and the life of the twentieth century and the educational ideal of a democracy. J.J.

Relating to Various Beliefs. The following articles in these volumes, while not all bearing on superstition, are of interest in this connection:

Alchemy	Necromancy
Astrology	Occult
Clairvoyance	Palmistry
Conjuring	Phrenology
Demonology	Physiognomy
Divination	Psychical Research
Ectoplasm	Psychoanalysis
Faith Cure	Spiritualism
Hypnotism	Subconscious
Magic	Suggestion
Medium	Telepathy
Mesmerism	Witchcraft
Mind Reading	

SUPERVISED STUDY. Down to a century or so ago, there was no class recitation in schools; pupils recited individually to the teacher at his desk. Each pupil prepared his lesson alone, reporting to the teacher when he thought he had mastered the task assigned him; and the teacher simply listened to him, in order to determine whether he had memorized his lesson accurately. But, as education became more popular, in the sense that a larger proportion of children went to school, it was found economical to group those of the same age or similar intellectual advancement into a "grade," so that they could work and recite as a group, or class. This plan of conducting schools has been followed more or less rigidly for a century or more. But during the last few decades there has been developing a conviction that the graded plan has serious faults, principally because it tends to obliterate individuality. Much has been heard of the "lock step in education." This phrase has been used to condemn the practice of treating all children of the same age as though they possessed the same measure of intellectual power. It has been said very freely that this graded system has made it impossible for well-endowed pupils to push forward in their development as rapidly as their talents would warrant, while, at the same time, it has tended to overtax the inferior pupils.

When thirty or forty pupils are taught in the same group or class, it is difficult, and most teachers have thought it was impossible, to give much if any attention to individual pupils. If a pupil was too slow to keep up with the group, he was likely to encounter insurmountable obstacles when he began to fall behind the class. His teacher would not spend time with him, to help him to surmount his obstacles, and so he would be likely to go from bad to worse. Further, a teacher having a large group under her care could not give any assistance to an exceptionally bright pupil, in

order to enable him to "skip" a grade. Whenever the graded plan has been followed rigorously, it has been practically impossible for any pupil to progress more rapidly than his grade.

In a grade of from forty to fifty pupils, whenever a pupil needs special help, his teacher is compelled to tell him that he must secure it outside of school, and this means that his parents must help him, so that home study is required of all pupils who find it difficult to keep up with their class. Even the brighter pupils are required to master some of their tasks at home. Serious complaint has been lodged against this requirement, by parents who have maintained that their children should receive all the assistance they need in the school, and that the home should not be converted into a schoolroom. There has been a growing conviction, too, that, when a pupil leaves the school, he should leave school tasks behind him, so that he may have time for relaxation and for participation in home activities.

Remedying the Defects of the Graded System. In order to meet the criticisms that have been directed against the graded system, various plans have been suggested, with a view to providing for the needs of individual pupils and supervising the preparation of their lessons, so that they could utilize their time in the school to the greatest advantage. It has been shown that without direction most pupils acquire wasteful habits of study. This is particularly true when they do much of their work at home. Investigations have revealed the fact that the majority of parents do not understand how to assist their children so that they can gain initiative, resourcefulness, and independence in the performance of intellectual tasks. There has been continually increasing complaint on the part of teachers respecting the bad mental habits which pupils acquire in the study of their lessons at home, so that there is to-day widespread belief that it would be better if pupils would receive little or no help in their school work from their parents.

But if a pupil is not likely to adopt the most economical and effective methods of study on his own initiative, and if his parents cannot help him to acquire these methods, then it follows that the teacher must direct the pupil's study, for the purpose of preventing him from contracting wasteful and ineffective habits. Different plans have been proposed and tested, in order to meet these requirements. In Pueblo, Colo., all class recitation and home study in the schools of the city were abolished, and "supervised study" was substituted. Following this plan, a teacher dealt with each pupil individually, and he was permitted to go forward in any subject as rapidly

as his native ability and his power of concentration would enable him to do. This was known as the Pueblo Plan.

Following this experiment, Batavia, N. Y., adopted the plan of having periods of supervised study or directed study, to supplement class instruction. All pupils were required to prepare their lessons during these prescribed periods, and teachers supervised their method of work. This is known as the Batavia Plan. It has been applied in different forms in various cities throughout the country. In some places, the teachers in charge of an assembly or study room in a high school supervise the work of the pupils while they are preparing their lessons. In other cities, pupils who are deficient or delinquent in any study are required to attend make-up study classes, in which their work is supervised by the teachers in charge. In still other cities, pupils are permitted, on their own initiative, to attend supervised study classes if they wish to receive assistance. According to this plan, no pupil is *required* to attend a supervised study class, but any pupil may be permitted to do so. Finally, the principle of the Batavia Plan is applied in some of the schools of the country in the establishment of a double-class period, a part of which is devoted to recitation, and the rest of it to preparation of advanced work under the supervision of the teacher. M.V.O'S.

SUPINATORS, *su pih na' torz*. See ARM.

SUPPLY AND DEMAND. In economics, *supply* refers to the quantity of goods that will be offered for sale, in a given market, at various prices; and *demand* refers to the quantity of goods that will be purchased at various prices. The relation between the supply and demand determines the price of the commodity. If the supply is great, as compared with the demand, the price will be low; and if the supply is small, as compared with the demand, the price will be high. For a more detailed discussion of this principle, see VALUE (Supply and Demand); ECONOMICS. E.J.

SUPRARENAL, *su prah re' nal*, **CAPSULES.** See ADRENALIN.

SUPRARENALS. See GLANDS (Ductless Glands).

SUPREMACY, ROYAL, an English legal term used to denote the power of the king over the Established Church. Until the period of the Reformation in England, the Pope had been the acknowledged head in ecclesiastical matters. In 1534, after the Pope had refused to annul the marriage of Henry VIII and Catharine of Aragon, and to declare the marriage with Anne Boleyn valid, Henry induced Parliament to declare him head of the English Church. Twenty years later, Mary had this act repealed, but in the reign of Elizabeth, Parliament passed a new Act of Supremacy. To-day, the theory of royal supremacy is rec-

ognized, but the king exercises no control over spiritual matters. See CHURCH OF ENGLAND.

SUPREME COURT OF THE UNITED STATES, the highest judicial tribunal in the American republic and the most dignified body of its kind; its members are vested with greater power than is delegated to any other court in the world. Its existence was authorized in the Constitution of the United States (Art. III, Sec. I):

The judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain and establish.

The Constitution did not declare the method of organization of the court, nor specify the number of justices of which it should be com-



THE TEN JUDICIAL CIRCUITS

The territories of Alaska and Hawaii are included in the ninth circuit.

posed. To Congress was delegated the duty of organization, and in 1789 a law was passed which provided—

. . . that the Supreme Court of the United States shall consist of a Chief Justice and five Associate Justices, any four of whom shall be a quorum, and shall hold annually at the seat of government two sessions, one commencing the first Monday of February and the other the first Monday of August.

It is an error to give the members of the Supreme Court the title of *judges*. The act of Congress referred to them as *Justices*, a title of greater dignity and one which declares by inference their more exalted station. As the demands upon this court have increased, there have been additions to the number of justices; there are at present one Chief Justice and eight Associate Justices. Members of the Supreme Court are appointed by the President of the United States, subject to confirmation by the Senate.

It has been found difficult at times to secure the appointment of men of requisite legal ability and standing, who would consent to serve for the low remuneration provided by law. When the court was organized, the Chief Justice received \$4,000 per year and the Associate Justices \$3,500. Later, the Chief Justice received \$10,500 and Associate Justices

\$10,000 per year. In 1907 the compensation was again increased to \$13,000 and \$12,500, respectively; in 1911 to \$15,000 and \$14,500; and in 1926 to \$20,500 and \$20,000, respectively. To remove members of this high court from every political influence, the Constitution provides that they shall hold their places during life or good behavior, and that any member, upon reaching the age of seventy years, may retire from service, if he has been ten years a Justice, and receive thereafter, as long as he lives, the regular salary of an Associate Justice.

Powers of the Supreme Court. The Constitution, in Art. III, Sec. 2, defined the classes of cases over which the Supreme Court is given jurisdiction. These are briefly summarized and explained below:

All cases affecting ambassadors, other public ministers, and consuls. [These are officials of the general government whose relations are entirely with foreign governments. Therefore the national government, instead of a court of the state in which the litigant may reside, should have original jurisdiction.]

All cases of admiralty and maritime jurisdiction. [The high seas belong to all nations, and an offense committed thereon naturally should be tried by a court representative of the nation involved.]

All controversies to which the United States shall be a party. [In cases of this nature, the entire citizenship of a country is interested, and a national tribunal rather than a state court must decide the issues.]

All controversies between two or more states. [To permit a court in one of the contending states to settle such a controversy would be prejudicial to fair judgment. An outside tribunal is necessary, to which all parties may appeal.]

All controversies between a state and citizens of another state, or between citizens of different states, and between the citizens of the same state claiming lands under grants of different states. [The same reasons apply as in the case last mentioned.]

All controversies between a state or the citizens thereof and foreign states, citizens, or subjects. [If citizens of any state offend a foreign state or its citizens or subjects, the peace and honor of an entire nation are involved, rather than the safety of a single state.]

Power over Legislation. The Supreme Court possesses unique power. It is the only court in history that has ever possessed the right to deny the validity of a national law. A law of Congress is invalid and of no effect, if the Supreme Court by majority vote finds that it is contrary to the letter or spirit of the Federal Constitution. The Court is empowered to pass also upon the validity of any state law; such a law cannot remain effective if it is contrary in letter or spirit to the Constitution of the United States. It also has appellate jurisdiction over the Federal circuit courts and in some cases over state supreme courts.

Inferior Courts. The Constitution provided that the judicial system should consist not only of a Supreme Court, but of such inferior courts as Congress may establish. With the



Supreme Court Members, Early in 1930. Chief Justice Taft, in center among those seated, resigned February 3, 1930, and died March 8. Standing, from left to right, Justices Sanford (died March 8), Sutherland, Butler, Stone. Seated, McKeenolds, Holmes, Taft, Van Deventer, Brandeis. Charles Evans Hughes succeeded Taft as Chief Justice; John J. Parker, named to succeed Sanford, was rejected by the Senate on May 7, 1930; Owen J. Roberts was then named.

Photo: U & U

growth of the country, district courts and United States circuit courts were established. In 1911, circuit courts of appeal were established in place of the old circuit courts. They are located throughout the country in ten judicial circuits. One Justice is assigned to the oversight of each circuit.

Chief Justices. Since the organization of the Supreme Court, there have been nine Chief Justices. The longest tenure of office was that of John Marshall, who served more than thirty-four years. Following is a complete list:

John Jay, of New York. Appointed in 1789 by President Washington, resigning in 1795, to become governor of New York. See JAY, JOHN.

John Rutledge, of South Carolina. Appointed in 1795 by President Washington. He presided over one term of the court, but the Senate refused to confirm his appointment in December of that year, on the ground of lack of qualification.

Oliver Ellsworth, of Connecticut. Appointed in 1796 by President Washington. He resigned in 1799, to accept appointment as minister to France.

John Marshall, of Virginia. Appointed in 1801 by President Adams, and served until 1835. William Cushing of Massachusetts was appointed, but declined the honor. See MARSHALL, JOHN.

Roger B. Taney, of Maryland. Appointed in 1836 by President Jackson. He served until his death, in 1864. See TANEY, ROGER B.

Salmon P. Chase, of Ohio. Appointed in 1864 by President Lincoln. He served until his death, in 1873. See CHASE, SALMON P.

Morrison R. Waite, of Ohio. Appointed in 1874 by President Grant. He died in 1888.

Melville W. Fuller, of Illinois. Appointed in 1888 by President Cleveland. He died in 1910. See FULLER, MELVILLE W.

Edward D. White, of Louisiana, then an Associate Justice, was appointed in December, 1910, by President Taft. He died in 1921.

William Howard Taft, former President. Appointed in 1921; resigned Feb. 3, died March 8, 1930.

Charles Evans Hughes, former Associate Justice. Appointed by President Hoover, 1930. E.D.F.

Related Subjects. The reader is referred in these volumes to the articles COURTS and CONSTITUTION OF THE UNITED STATES, particularly the sections quoted above.

SURAJAH DOWLAH, *soo rah' jah dou' lah*. See BLACK HOLE OF CALCUTTA.

SURAT, *soo rah'*. See INDIA (The Cities).

SURFACE MEASURE, TABLE OF. See DENOMINATE NUMBERS.

SURGEON BIRD. See JACANA.

SURGERY, as well as other departments of healing, has made remarkable progress since the beginning of the nineteenth century. Both medicine and surgery owe a debt, one that cannot be estimated, to three great discoveries of that century: anesthesia; the germ origin of putrefaction and disease; and that reliable friend of diagnosis—the X-ray. In the days before anesthetics were used, surgical operations entailed such agony that the surgeon was dominated by one idea, and that was to conclude his work as quickly as possible.

To-day, he is able to perform delicate and intricate operations on the brain and abdominal organs, because he can work on a relaxed and unconscious patient who can be kept under anesthesia as long as may be necessary. The first anesthetics to be used in professional practice were nitrous oxide, or laughing gas, ether, and chloroform, all of which were introduced between 1840 and 1850. Ethylene for general anesthesia, harmless derivatives of cocaine for local use, and the drugs of twilight sleep for childbirth, are some of the newer drugs now being employed. The administration of nitrous oxide has been greatly improved by the invention of apparatus for mixing it with oxygen. Some of the other modern developments in anesthesia include nerve blocking, intraspinal anesthesia, and the administration of narcotics to quiet the patient's nerves before the anesthetic is administered (see ANESTHETIC).

The great biological chemist Louis Pasteur laid the foundation for antiseptic surgery when his long-continued research revealed conclusively that certain one-celled organisms are the cause of infectious diseases, and that putrefaction is the result of bacterial activity. Joseph Lister, an English surgeon, applied Pasteur's discovery to his work, and about 1865 began a technique in the operating room that was to revolutionize surgical practice.

Lister developed a method of destroying the germs that were causing so many of his patients to die of blood poisoning, after successfully withstanding severe operations. The modern technique is a refinement of "Listerism," with the emphasis placed on keeping out infection by means of scrupulous cleanliness, entailing the use of antiseptics previous to the operation. In the article ANTISEPTIC, the reader will find a detailed description of modern aseptic surgery, as it is termed.

The relation of the X-ray to diagnosis is of fundamental importance. This great ally of the physician and surgeon alike was discovered in 1895 by Wilhelm Roentgen. By means of X-ray apparatus, shadow pictures are taken that reveal bone fractures, hidden objects such as bullets, lung tuberculosis, tumors and cancers, abscesses, gallstones, and many other abnormal conditions. The information thus revealed enables the surgeon to avoid unnecessary operations, gives him a definite idea of the location and nature of the ailment, and permits a refinement of diagnosis undreamed of in the era preceding Roentgen's discovery. The X-ray also has curative effects, and may sometimes be a substitute for operation, as in treatment of malignant growths in the early stages. Radium, whose discovery was a later development of experimentation in the field of radiation, is likewise an agent of healing that in some cases makes operation unneces-

sary. Thus modern surgery has not only perfected the art of healing with the knife, but has found ways of avoiding use of the knife.

The scope of surgery as practiced to-day is too wide to permit a complete listing of its achievements, but the following is typical of what is being done in modern hospitals. Some of the most remarkable cures have been effected in the treatment of abdominal diseases. It is not considered an unusual operation, for instance, to remove the affected part of a diseased intestine, even several feet of it, and to sew the severed ends together. Sometimes two openings are made in the intestine, one above the diseased part and one below. Then the two openings, placed opposite each other, are united, and the contents of the organ follow the new route. An enlarged spleen, a diseased gall bladder, or a diseased kidney may be removed, and the patient make a complete recovery. Diseased kidneys are also opened and drained and freed of abscesses, and a floating kidney is sewed fast to the proper place of attachment.

Great advance has also been made in the treatment of brain diseases. Tumors and abscesses in this organ can be successfully removed, cut arteries can be secured, gunshot wounds cured, and pressure on the brain corrected. Certain forms of epilepsy caused by disease of the brain have been cured by operation. Other triumphs of surgery are the correction of squint (crossed eyes), grafting of healthy skin on raw wounds or burns, transfusion of blood, straightening of crooked legs, and transplantations of healthy organs, pieces of bone, and tissues, to take the place of diseased parts. The knife is still the most

important means of cure for cancer, and surgery is successfully applied in numerous cases of goiter and other thyroid disturbances.

W.A.E.

Related Subjects.

The subject of surgery is closely connected with the following topics in these volumes. Since a number of these have extensive indexes, the range of reading indicated is a wide one.

- Amputation
- Anatomy (with list)
- Anesthetic
- Antiseptic
- Bacteria and
- Bacteriology
- Bandage
- Disease (with list)
- Disinfectants
- Fracture
- Granulation
- Hospital
- Medicine and Drugs (with list)
- Radium
- Roentgen Rays
- Tourniquet
- Vivisection



Photo: Geological Survey

HOW THE GEOLOGICAL SURVEY WORKS

Its members climb high mountains, descend into lowest places, search the wilds, penetrate almost inaccessible spots, and find no task too severe to enable them to make correct computations of America's physical features. The man in the illustration is on the summit of Post Peak, in the Yosemite Valley of California.

and determining angles to fix boundaries. *Land surveying*, with which most people are familiar, is for the purpose of fixing boundaries and determining areas of comparatively small plots of ground. In the United States and Canada, the boundaries and divisions of public lands have been fixed by government surveyors. The land surveyor uses two instruments for running his lines—a surveyor's compass, or a transit, and a chain for measuring distances. The accompanying diagram deals with land surveying.

Surveying for fixing boundaries is often called *plane surveying*. *Topographical surveying* is conducted on a much larger scale, and includes the measuring of altitudes and the mapping of elevations and depressions within the region. Topographical surveying is used

SURINAM, *soo ri' nah'm'*, a name sometimes applied to Dutch Guiana (which see).

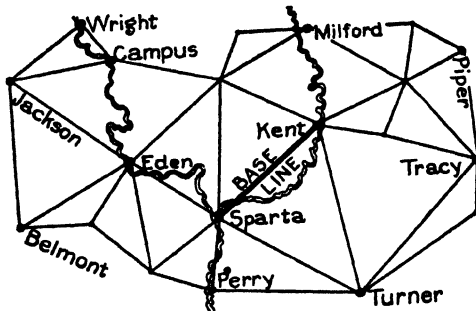
SURREY, EARL OF. See BLANK VERSE; SONNET.

SURTAX. See INCOME TAX.

SURVEYING, *sur va' ing*, the art of ascertaining the shape and area of any portion of the earth's surface, or of running lines

in making surveys for maps, and is usually under the direction of the national government.

The art of surveying is as old as civilization; it originated in Egypt, where the inundations of the Nile annually obliterated boundaries.



HOW AN AREA IS SURVEYED

Starting with a base line, as between Sparta and Kent, in the drawing, other lines are laid, completing a triangle. With one of the new lines as a base line, another triangle is laid out. This process is continued until all the objectives have been gained.

Based on the science of geometry, surveying requires a thorough knowledge of mathematics, and the ability to use delicate instruments with a high degree of accuracy.

The World War brought about several new scientific inventions; nautical surveying developed new aids to navigation; and an entirely new branch of the science came into existence in aerial survey, which measures distances on the ground by means of aerial photography.

Related Subjects. The reader is referred to the following articles in these volumes:

Coast and Geodetic Survey
Compass

Engineering
Lands, Public

SURVEY OF PUBLIC LANDS. See **LANDS, PUBLIC** (Ranges, Townships, and Sections).

SURVEYOR'S COMPASS. See **COMPASS.**

SURVIVAL OF THE FITTEST. See **EVOLUTION; NATURAL SELECTION.**

SUSA, su' sah. See **PERSIA** (The Cities).

SUSPENSION BRIDGE. See **BRIDGE, subhead.**

SUSQUEHANNA RIVER, a waterway through one of the most important industrial regions in Eastern United States. It is formed by the union of two small branches whose sources are, respectively, Schuyler and Otsego lakes, in Central New York. The main stream flows in a general southwesterly direction to the Pennsylvania line, traverses that state in an irregular course southward, and then flows for a short distance through Maryland, entering Chesapeake Bay at Havre de Grace. Its total length is about 500 miles, and its chief tributaries are the Chemung, the West Branch, and the Juniata. It is of little value

as a commercial route, because of its swift current and shallowness. On its banks lie the cities of Harrisburg and Wilkes-Barre, Pa., Port Deposit, Md., and Binghamton, N. Y.

SUTLEJ RIVER, the most southerly of the five waterways of the Punjab, in India, and the largest tributary of the Indus (which see). Rising in the lofty plateau of Tibet, nearly three miles above the sea, the Sutlej winds its way through the passes of the Himalayas, traverses the hill states of Simla, and then flows in a southwesterly direction through the Punjab, joining the Indus near Mithankot. Its length is about 950 miles. Below its junction with the Chenab, the most important tributary, it is called the Panjnad, or Five Rivers. The Sutlej is of little importance as a navigable waterway, except for inland craft, but its waters are used in irrigating the arid plains of the Punjab. In recent years, the irrigation system has been greatly developed; over ten million acres are now irrigated.

SUTRO TUNNEL. See **NEVADA** (Minerals).

SUTTEE, suh te', a variation of the Sanskrit word *sati*, meaning *good wife*, is the name given to the practice, formerly common among all the Hindus, of burning the widow on the funeral pyre of her deceased husband. If the husband died away from home, she occupied the pyre alone. The custom is not enjoined in the Vedas, but it seems to be of great antiquity, for when Alexander the Great visited India, about 327 B.C., he encountered it.

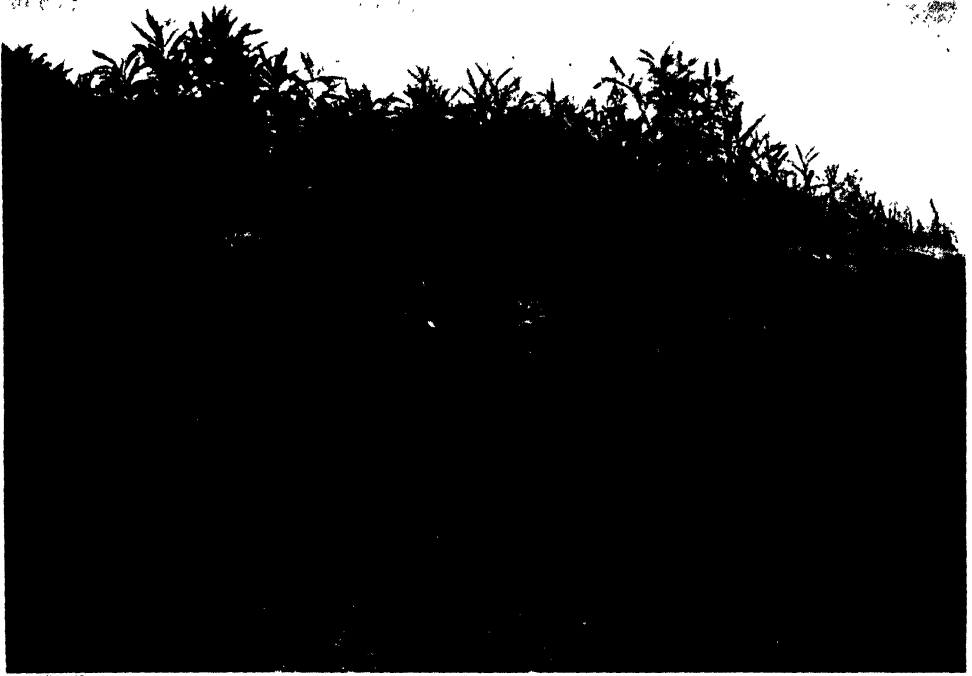
In theory, the widow always was willing to sacrifice herself; in practice, compulsion was often used, but one of the emperors in the seventeenth century forbade thereafter all but voluntary immolations. The exact methods by which it took place were various. Sometimes the widow leaped upon the burning pile from a window; sometimes she lay down upon the unlighted heap, clasping in her arms the dead body of her husband; and sometimes she herself was required to set fire to the pile.

The British always disapproved of the suttee in India, but were not able until 1829 actually to prevent it. Naturally, it did not cease all at once, and it is quite probable that, in rare cases, the practice is still secretly maintained, although those now found guilty of aiding or abetting it are sentenced to a penal colony. See **INDIA** (Social Customs).

SUTTER, JOHN A., an early settler in California, on whose land gold was discovered in 1848. See **CALIFORNIA** (Discovery of gold).

SUTTER'S MILL. See **CALIFORNIA** (Discovery of Gold).

SUWANEE RIVER, a stream that winds through North-Central Florida for about 240 miles, and empties into the Gulf of Mexico. The river rises in the swamps of Southern Georgia, meanders past small villages, and



The swallow is come!
The swallow is come!
O, fair are the seasons, and light

Bank swallows, smallest members of the family, live in colonies in nests which they have dug in the precipitous sides of sand hills; sometimes a colony will contain more than a hundred nests. Below, at left, a bank swallow; at right, a barn swallow. (See SWALLOW, page 6946.)

carries no traffic except wide-bottomed row-boats. Yet it is as famous as the Hudson, for Stephen Foster (which see) began that haunting and simple song, *Old Folks at Home*, with the words:



Photos Keystone; Visual Education Service

Are the days that she brings,
With her dusky wings,
And her bosom snowy white!
—LONGFELLOW: *Hyperion*.

Way down upon the Suwanee River,
Far, far away,
Dere's wha my heart am turning ever,
Dere's wha de old folks stay.

SUZERAIN. See FEUDAL SYSTEM.

SVALBARD, the official name adopted by Norway for Spitsbergen (which see).

SWAHILI, *swah he' le*, a branch of the Bantu tribe in Africa. See **BANTU**.

SWALLOW, a small, graceful bird, with long, powerful wings, small, weak feet fitted only for perching, and a large mouth adapted to the capture of insects, upon which it feeds almost exclusively. It devours countless numbers of mosquitoes.

Swallows are found in all parts of the world. Most of them are migratory, flying great distances to avoid cold or to find a food supply. So far as known, they migrate by day, flying together in large numbers and spending the nights in woods or marshes. They nest both in pairs and in colonies. Some make their homes in holes in banks or trees, and others build rough, stuccoed nests of clay or mud, which they place on beams of bridges or on rafters in barns. Several species have modified their nesting habits through their contact with man. The three to nine eggs are pure white or white spotted with brown. Swallows twitter rather than sing.

Among the swallows of North America are the *barn swallow*, with steel-blue back, chestnut-colored breast, and deeply forked tail, perhaps the swiftest in flight of all birds, traveling 10,000 miles in yearly migration; the *cliff swallow*, distinguished from the barn swallow by its square tail; the *tree swallow*, which often nests in bird houses; the *bank swallow*, or *sand martin*, the smallest of the family; and the *purple martin* (see **MARTIN**). See, also, page 6945. D.L.

Scientific Names. The swallows belong to the family *Hirundinidae*. The barn swallow is *Hirundo erythrogastra*; the cliff, *Petrochelidon lunifrons*; the tree, *Tachycineta bicolor*; the bank, *Clivicola riparia*.

SWAMP FOX, a nickname applied to Francis Marion (which see).

SWAMP HICKORY. See **BITTERNUT**.

SWAMP ROSE MALLOW. See **HIBISCUS**.

SWAN, a stately water bird, belonging to the same family as the geese and ducks. The beauty of its snowy plumage and the proud poise of its long, graceful neck have ever suggested, to the song-writer and the poet, a majestic white ship sailing over the waters. It is a poetic fancy of unknown origin that the swan chants its own death dirge, whence the "swan song" famed in legend and in verse. This tradition has no scientific basis, but it has been the inspiration of many charming poetic lines, such as are found in the *Evening Songs* of the German poet Heine. [See the verse under the accompanying illustration.]

There are about eight species of the swan group, found in various parts of the world. They have the common habit of migrating in V-shaped flocks, and of uttering loud, trumpet-

like notes, when on wing. They subsist on the seeds and roots of water plants, and on worms and mollusks, dipping the long, curving neck far into the water as they probe the bottom.

The *American*, or *whistling*, *swan* nests in the vicinity of the Arctic Ocean and the Hudson Bay region, migrating in winter as far south as the Gulf of Mexico. Formerly, when these birds were more abundant than now, between October and April large flocks of the whistling swans wended their way southward, flying, it is said, at the rate of 100 miles an hour, and filling the air with sounds ranging from deep-bass notes to the shrillest tones of a clarinet. The nest, lined with down from the bird's own body, is made of sticks and water plants, and is sometimes two feet high and six feet across. Two to six eggs, grayish in color, are laid in June. The young, called *cygnets*, are at first covered with grayish-brown down, which becomes snow white by the end of a year. The unattractive appearance of young swans is the basis of the picturesque fable *The Ugly Duckling* (for a version of this story, see **STORY-TELLING**, in these volumes).

The whistling swan is a little less than five feet long, and is white except for a yellow spot between nostrils and eyes. The legs, feet, and bill are black. Similar to the whistling swan is the *trumpeter*, an American bird now rarely seen. It is larger than its whistling cousin, and has a call resembling the tones of a French clarion. Except for the presence of the yellow spot on the head of the whistler, these swans are alike in plumage.

In the eastern hemisphere are found the *European whistling swan*, *Bewick's swan*, a smaller bird, and the *mute swan*, the majestic species commonly seen in zoological gardens, parks, and estates. It is said that it never uses its voice in captivity. A beautiful species known as the *black swan*, which has a scarlet bill banded with white, is native to Australia. South America has the *black-necked swan*. D.L.

Scientific Names. Swans constitute the subfamily *Cygninae* of the family *Anatidae*. American naturalists place most of the species in the genus *Olor*, while the English synonym for this term is *Cygnus*. The whistling swan is *Olor columbianus*. The Australian swan is *Chenopsis atrata*.

SWAN, JOHN MACALLAN (1847-1910), an English painter and sculptor, noted for his studies of animals. Among his sculptures are *The Jaguar*, *Puma* and *Macaw*, *Wounded Leopard*, and *Leopard Running*. His paintings include *Ocelot and Fish*, *Tigers*, *Tigers Drinking*, *Ceylon Leopards*, and *Panthers Resting*. He also painted landscapes and human figures. Swan was born at Old Brentford, and studied in London and Paris. In 1905 he was elected to the Royal Academy.

SWANSON, GLORIA. See **MOVING PICTURES** (list of players).



And over the pond are sailing
Two swans all white as snow;

Sweet voices mysteriously wailing
Pierce through me as onward they go.



They sail along, and a ringing
Sweet melody rises on high;

And when the swans begin singing
They presently must die.

—HEINE: *Evening Song*.

At left, a black swan from Australia, at the zoo in Washington, D. C. At right, a happy family of white swans.

SWARTHMORE COLLEGE. See PENNSYLVANIA (Education).

SWASTIKA, *swahs' tik kah*, an ancient sign or symbol, now used as an emblem of good luck. It has been found in Byzantine architecture; and as an ornament and a symbol of religious import, it was used by the North American Indians. It also has been noted on Buddhist inscriptions, Celtic monuments, and Greek coins. It is shaped like a right-angled cross, with short upright extensions forming right angles on the long perpendicular and horizontal lines forming the cross. It may have represented the power or rays of the sun, or the flashes of lightning.

SWAYNE, CHARLES. See IMPEACHMENT.

SWAZILAND, *swah' zih land*, a British protectorate located at the southeastern corner of the Transvaal, South Africa. Politically, it is not a part of the Union of South Africa, as authority over Swaziland was transferred from the governor of the Transvaal to the British High Commissioner for South Africa, in 1906. The protectorate has an area of 6,704 square miles. The population, at the 1921 census, was 112,838, including 2,235 Europeans. There are four European villages. Mbabane, at an altitude of 3,809 feet, is the seat of government. See PROTECTORATE; AFRICA (Division into Countries).

SWEAT. See PERSPIRATION.

SWEATING. See WHEAT (Cultivation and Harvest).

SWEATING SICKNESS, a fatal disease first known in 1485 in England, and so called because it was characterized by profuse sweating. Successive epidemics appeared at intervals until 1551; and an outburst occurring in 1528 swept over Europe, causing thousands of deaths. An attack began suddenly with cold shivers, dizziness, headache, severe bodily pains, and prostration. The characteristic sweating followed the cold stage, and was accompanied by a sense of heat, delirium, intense thirst, and rapid pulse. The disease was sometimes fatal in a few hours. A modern form of sweating sickness, not usually fatal, is called *miliary fever*.

SWEATSHOP SYSTEM, the name applied to an industrial policy by which the manufacture of goods is carried on outside of the owner's premises, under conditions so unfavorable that they have aroused vigorous public protest. The name *sweatshop* suggests a place of grinding toil; the system, known also as the *sweating system*, has for its victims poor people who, under its unrestricted operation, have no means of escape from despair.

The manufacturers of clothing instituted the policy by contracting for the making of much of their product outside their own shops. Rents were saved, responsibility was shifted, management expenses were decreased, and factory laws evaded. The manufacturers prob-

ably did not foresee the evils which would result from the contract system. Under that system, a man or firm receiving a contract will sublet it to the owner of a small shop in a tenement district, where the people are in the grip of poverty and where labor is therefore cheap. The owners of such shops take contracts at as high prices as they can force from the middleman, and pay their employees on a piecework basis, giving them little more than enough to keep them alive. Working for so little, the employees often spend from twelve to eighteen hours a day at their tasks, to make their weekly wage as large as possible.

Another side of the system affects the home even more directly. Often a contractor will give work to a man who takes it into his home. His house becomes little better than a workshop, and he presses his family, even including little children, into the daily labor, and here, too, hours of work may extend into the night.

The sweating system is thus charged with overcrowding in shops, developing insanitary conditions, forcing children into labor without safeguards, and causing an increase in disease and deformity, due to confinement. The helpless workers are unable to improve their condition within their own ranks, because they are scattered and their employment is irregular. Complaints may deprive them of even the slight income they are able to earn.

The foregoing description pictures the system in its worst aspect in great cities, but the statement is not overdrawn. So scandalous have conditions become that thousands of people have pledged themselves not to purchase clothing made under the contract system. Public attention was first called to the matter when it was found that disease germs from the tenements were carried in the new clothing manufactured under the sweating system. Legislatures have taken official notice of the evil, and in some states have remedied conditions by laws which require light, airy, roomy buildings, reasonable hours of labor, regular inspection of machinery and premises, and restrictions upon the employment of children. In a large number of states which are highly industrial, the laws provide that all rooms where such work is performed shall be licensed and regularly inspected. There has also been a growing tendency toward reform, within recent years, among manufacturers themselves. Many of the largest clothing-producers have equipped buildings with plenty of room and every modern device, in order to provide security and health, and wages at present assure improved living. E.J.

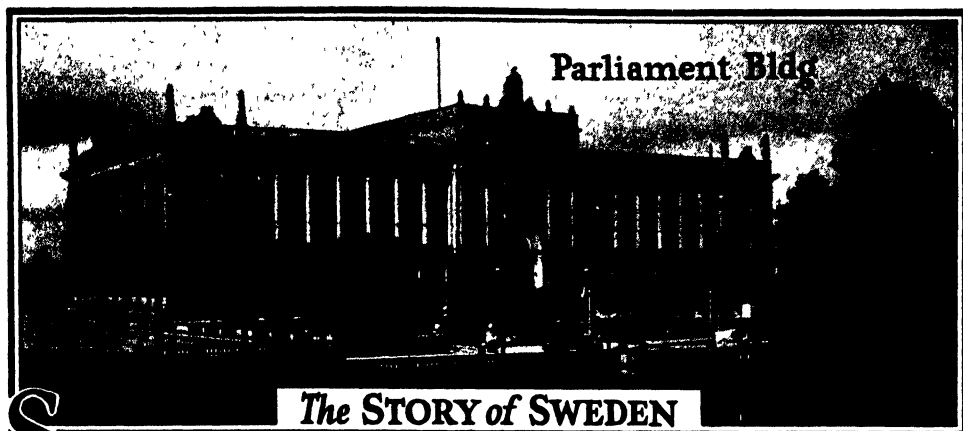
Related Subjects. The reader is referred in these volumes to the following articles:

Eight-Hour Day
Factory and Factory
System

Labor Legislation
Labor Organizations
Minimum Wage

SWEDEN, NORWAY AND DENMARK

DENMARK			Foerund Lake			Skien, 16,503			Kalix River		
Aalborg, 42,461	G	8	Folden Fiord	J	3	Skierstad Fiord	F	7	Kall Sjon (lake)	H	3
Aarhus, 75,271	F	8	Folden Fiord	G	4	Skogero (island)	R	2	Kalmar, 17,087	K	8
Bogense, 2,854	G	9	Frederickshald (Halden)			Smolen (island)	E	5	Kalmar Sound	K	8
Bornholm (island), 44,309	J	9	Frederickstad, 15,579	G	7	Snaasen Vand (lake)	H	4	Karlshamn, 7,605	J	8
Copenhagen (capital), 586,000	H	9	Fro Havet (sea)	F	4	Snehoetten (mt.)	G	5	Karlshamn, 27,055	K	8
Elsinore, 15,457	G	8	Froi Fiord	D	6	Sogne Fiord	D	6	Karlstad, 19,246	H	7
Esbjerg, 24,063	F	9	Fro Islands	F	4	Soone Fiord	D	6	Kathrineholm, 7,946	K	7
Faabor, 4,730	G	9	Froyen (island)	F	5	Soro (island)	N	1	Kattegat (sea)	G	8
Fredericia, 18,400	F	9	Galdhoppigen (mt.)	F	6	Spinte Njarg (peninsula)	P	1	Klar River	H	6
Fredericksberg, 103,484	H	9	Gausta (mt.)	F	7	Stadthund (peninsula)	D	7	Koping, 6,610	K	7
Frederickshavn, 9,633	F	8	Gjovik, 4,146	G	6	Stavanger, 43,883	D	5	Laholm, 2,179	H	8
Frederikssund, 3,119	G	8	Goddø (island)	D	7	Stenkjaer, 2,661	H	4	Laholm Bay	H	8
Funen (island)	G	9	Gula River	G	5	Stjerno Sound	M	1	Lando Sjon (lake)	J	5
Give, 3,027	F	9	Gursko (island)	D	5	Store Borge Field (mt.)	H	4	Landskrona, 20,173	H	9
Grena, 4,576	G	8	Halden (Frederickshald)			Stor Fond (mt.)	E	7	Lapland (district)	L	2
Hillerod, 6,310	G	8	11,218	G	7	Storo (island)	D	7	Lidköping, 8,365	H	7
Hjorring, 11,068	F	8	Hallingskarven (mt.)	F	6	Stov Fiord	D	6	Lina River	M	3
Hobro, 6,035	F	8	Hamar, 6,395	G	6	Strande Fiord	D	6	Lindesberg, 3,027	J	7
Horsens, 28,064	F	8	Hammerfest, 3,336	O	1	Syd Kvalo (island)	K	2	Lindköping, 26,920	K	7
Jammer Bay	G	8	Hareidland (island), 2,344	D	5	Sylte Fiord	R	1	Little Lulea River	M	3
Kallundborg, 6,567	G	9	Haugesund, 16,563	D	7	Tana Fiord	Q	1	Ljusdal, 9,091	J	5
Kjoge, 5,604	F	9	Herjehogna (mt.)	G	6	Tana River	P	2	Ljusne River	J	5
Kolding, 16,681	F	9	Hindø (island)	J	2	Thren Islands	G	3	Lofsta Bay	L	6
Korsor, 9,804	G	9	Hiteren (island)	F	7	Tombo (island)	H	3	Loftholm, 10,545	M	4
Laeso (island), 3,052	G	8	Holmestrand, 2,196	F	7	Tonsberg, 12,588	G	7	Lysekil, 4,219	G	9
Lemvig, 4,410	F	8	Holsten (island)	D	6	Tromsø, 10,071	L	2	Malmö, 113,558	G	9
Logstor, 2,726	F	8	Holnes (island)	G	6	Trondhjem (Nidaros)	G	5	Marstrand, 5,311	J	8
Lum Fiord	F	8	Holnes, 3,008	G	6	45,520	G	5	Markaryd, 3,622	J	8
Maribo, 4,608	G	9	Indre Sulen (islar G)	D	6	Tys Fiord	K	2	Mora, 9,997	J	6
Moen (island), 14,013	H	9	Itre Sulen (island)	D	6	Ulfo (island)	J	2	Motala, 5,807	J	7
Nakskov, 13,950	G	9	Jostedal Bræ (glacier)	E	6	Vaagso (island)	J	2	Munio River	N	3
Nexo, 2,754	J	9	Kistrand, 2,160	O	1	Vando (island)	L	1	Nassjö, 8,539	J	8
Norresundby, 6,416	G	8	Kjorgos Njarg (peninsula)	P	1	Vanger Fiord	R	1	Nora, 2,389	J	7
Nykjobing, 8,288	G	9	Kongsberg, 7,228	F	7	Vardo, 3,103	R	1	Norrköping, 58,101	K	7
Odense, 52,208	F	9	Kongso Fiord	R	1	Varjag Njarg (peninsula)	Q	1	Norrtelge, 4,959	L	7
Randers, 26,817	F	8	Kragero, 4,641	F	7	Veblungsnes (lake)	F	5	Ockelbo, 9,517	K	6
Ribe, 5,484	F	9	Kroden Fiord	F	6	Vedo (island)	G	3	Oland (island)	K	8
Ringkjøbing, 3,882	E	8	Kvenang Fiord	M	1	Vegen (island)	G	3	Orebro, 36,033	J	7
Ringkjøbing Fiord	E	8	Lang Field (mts)	E	5	Vesteraalen (islands)	J	2	Oregund Bay	L	6
Ringsted, 5,618	G	9	Langs (island)	J	2	Vest Fiord	J	3	Ornskoldsvik, 4,320	L	5
Ronne, 10,534	J	9	Larvik, 11,391	F	7	Vigten Islands	F	4	Orsa, 8,399	J	6
Roskilde, 13,400	G	9	Laxe Fiord	P	1	Vik, 3,309	E	6	Oscarshamn, 9,231	K	8
Samsø (island), 7,263	G	9	Leko (island)	G	4	SWEDEN			Ostersund, 13,405	J	5
Silkeborg, 11,445	F	8	Lillehammer, 5,199	G	6	Alingsås, 6,246	H	8	Ostmark, 3,823	H	6
Skagen, 3,984	G	8	Lofoden Islands	I	2	Amal, 5,655	H	7	Ostra Dal River	H	6
Skanderborg, 4,061	F	8	Logen River	G	6	Angerman River	K	5	Pantas Jaur (lake)	L	2
Skaw, The (cape)	G	8	Lom, 2,438	F	6	Angeso (island)	M	5	Pitea, 3,047	M	4
Skive, 8,642	F	8	Luro (island)	H	3	Arboga, 5,085	J	7	Pitea River	L	3
Slagelse, 13,838	G	9	Maals River	L	2	Arjeplog, 3,195	K	3	Ranea, 8,838	N	4
Sound, The	H	9	Maelstrom (whirlpool)	G	3	Arvika, 7,045	H	7	Ranea Fiord	N	4
Svendborg, 14,395	G	9	Magero (island)	P	1	Asele, 5,413	K	4	Ronneby, 3,360	J	8
Thisted, 7,746	F	8	Mandal, 3,473	E	7	Askersund, 2,057	J	7	Sagat Troesk (lake)	K	3
Varde, 5,805	F	9	Melo (island)	H	3	Asnen (lake)	J	8	Sala, 7,853	K	7
Vejle, 22,497	F	9	Miosen Lake	G	6	Bjorko (island)	L	7	Sandhammar (point)	J	9
Vordingborg, 5,505	H	9	Molde, 2,808	E	5	Bjuro Cape	M	4	Sax River	J	6
NORWAY			Mosken (island)	H	3	Boras, 28,223	K	8	Siljan Lake	H	7
Aalesund, 16,547	D	5	Moskenesø (island)	H	2	Bracke, 2,885	K	5	Skara, 6,259	H	7
Aasnes, 5,875	H	6	Moss, 8,950	G	7	Bygde, 7,664	M	4	Skelleftea, 2,984	M	4
Alsten (island)	G	4	Namsen River	H	4	Christianstad, 12,743	J	9	Skelleftea River	L	4
Alten Fiord	N	1	Namsos, 2,605	G	4	Cimbrishamn, 2,340	J	9	Soderhamn, 11,262	K	6
Alten River	N	2	Narvik, 5,984	K	2	Eksjo, 5,903	J	9	Soderhamn, 2,598	K	7
Alte Vand (lake)	L	2	Naze, The (cape)	E	7	Engelholm, 4,921	H	8	Sodertelje, 14,964	L	7
Ando (island)	J	2	Nidaros (Trondhjem)			Enkoping, 5,938	K	7	Solleftea, 2,661	K	5
Arendal, 10,358	F	7	54,520	G	5	Esiklunna, 30,253	K	7	Solvesborg, 3,758	J	8
Arno (island)	M	1	Nisser Vand (lake)	E	7	Falkenberg, 4,986	G	8	Son Field (mt.)	H	5
Asko (island)	D	6	Nord Kvalo (island)	L	1	Falkoping, 6,235	J	7	Sorsele, 4,181	K	4
Aurdal, 8,584	F	6	North Cape	P	1	Falun, 12,719	K	6	Ster Sjon (lake)	J	5
Aursund Lake	H	5	Odde, 6,294	E	6	Faro (island)	L	8	Stockholm (capital)	L	7
Avero (island)	E	5	Os, 3,714	D	6	Filipstad, 4,724	J	7	419,429	L	7
Bals Fiord	M	2	Oslo (capital), 258,341	G	2	Gefte, 37,746	K	6	Stora Lulea Jaur (lake)	L	3
Bindalen, 2,728	H	4	Ost Vaagen (island)	J	2	Gotland (island), 55,804	L	8	Stor Avan (lake)	L	4
Bindal Fiord	J	3	Otteren (island)	K	2	Gottenborg, 202,365	G	8	Stor Uman (lake)	K	4
Bodo, 4,841	J	3	Otterø (island)	G	4	Gottiska Sando (island)	L	7	Strengrus, 4,168	K	7
Bommel Fiord	D	7	Rado (island)	D	6	Great Lulea River	M	3	Stroms Wattedal (lake)	J	4
Bommel (island)	D	7	Ramsø Fiord	E	5	Halmstad, 18,409	H	8	Sulitelma (mt)	K	3
Bremangerland (island), 2,867	D	6	Rands Fiord	G	6	Haparanda, 2,784	N	3	Sundsvall, 16,776	L	5
Brevik, 2,449	F	7	Ringvatso (island)	L	2	Hedemora, 3,274	K	6	Syltopperne (mt)	H	5
Brono, 3,738	G	4	Rodo (island)	H	3	Hedesunda, 5,142	K	6	Tornea River	N	3
Bukke Fiord	D	7	Romsdal Islands	D	5	Helsingborg, 47,074	H	9	Tornea Troesk (lake)	L	2
Christiansand, 16,543	F	7	Roros, 5,164	G	5	Hernösand, 9,740	L	5	Trollhattan, 14,763	H	7
Christiansund, 15,183	E	5	Rorot (island)	H	3	Hessleholm, 3,352	H	8	Uddeval, 13,753	H	7
Dals Fiord	D	6	Ros Vatna (lake)	J	4	Hjo, 2,538	J	7	Ulrikelamm, 3,287	H	8
Dovre Field (mts)	F	5	Salten Fiord	H	3	Horn Avan (lake)	K	3	Umea, 6,976	M	5
Drammen, 26,174	F	7	Sandefjord, 5,637	G	7	Hornsland (point)	K	6	Upsala, 28,897	K	7
Dynneso (island)	H	3	Sandhorn (island)	H	3	Hudiksvall, 7,561	K	6	Ursvik Fiord	M	4
Eidsvold, 10,408	G	6	Sandnes, 2,809	E	7	Hudiksvall Fiord	K	6	Vaxholm, 3,354	K	8
Elverum, 11,268	H	2	Sarpsborg, 10,881	G	7	Indal, 2,774	K	5	Visby, 9,324	L	6
Engelo (island)	J	2	Sartoro (island)	D	6	Indals River	J	5	Waddo (island)	H	7
Faa Fiord	D	6	Seiland (island)	N	1	Ivarstenen (lake)	K	3	Wenner, Lake	H	7
Flekkefjord, 2,176	D	7	Senjen (island)	K	2	Jonkoping, 29,284	M	5	Wenersborg, 8,793	H	7
			Skagastolindierne (mts)	F	6	Jornas Cape	M	5	Westra Dal River	H	6
			Skagerrack (sea)	E	8	Kage Fiord	M	5	Wetter Lake	J	7
			Skien, 16,503	F	7	Kaitum River	M	3	Widder River	K	4
									Ystad, 11,336	H	9



SWEDEN, a kingdom of Northern Europe, occupying the eastern and larger portion of the Scandinavian Peninsula. Because of the great number of lakes, rivers, and watery lanes in the country, it has been called "a vast fresh-water archipelago," and there is an old saying that when God divided the water from the land, Sweden was overlooked.

Size and Location. Sweden covers 173,000 square miles. It is almost 200 miles longer than the state of California, but is not so wide. About one-twelfth of the total area is under water. The seacoast extends 1,400 miles when measured in a straight line, but, although the bays and indentations are not so numerous or deep as those of Norway, the coast is penetrated by many inlets, and over 4,700 miles are washed by the sea. The Gulf of Bothnia, on the east, separates Sweden from Finland, and across the Baltic Sea, on the southeast, lie Estonia, Latvia, Lithuania, and Germany. The southern end of Sweden almost touches Denmark across the Sound; the Cattégat and Skagerrak, invading the Scandinavian Peninsula on the south, separate the southernmost areas of Sweden and Norway.

The People. The Swedes are an enlightened and educated people, and with the other Scandinavians are among the world's progressive peoples. They are more vivacious and light-hearted than their western kinsmen, the Norwegians, but they have the same reputation for frankness, honesty, and industry.

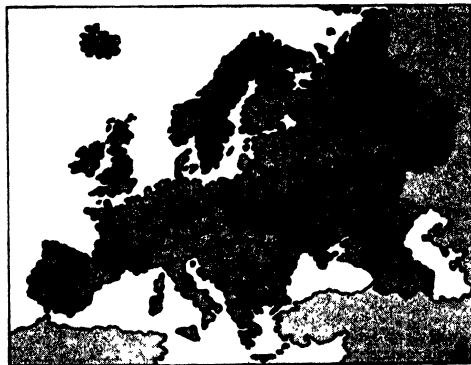
Large numbers of Swedes have emigrated to the Northwestern states of the American Union. Nevertheless, the home population has doubled in the last century. In 1927 it was estimated at over 6,000,000. With the exception of 30,000 Finns, 7,100 Lapps, and a few thousand foreigners, the entire population is Scandinavian. A large proportion of the inhabitants live in the rural districts.

The Cities. Stockholm, the beautiful capital, is described in these volumes under its title.

Other cities of importance are described below.

Gothenburg, *gol' en burg* (spelled on European maps GÖTEBORG), next to Stockholm is the largest and most important city, and the country's chief port on the Cattégat. It is connected by the scenic Göta Canal with Stockholm, on the Baltic coast. The chief industries are cotton-spinning, sawmilling, shipbuilding, and the manufacture of iron and steel. An extensive trade is conducted; the harbor, which is now the largest in Sweden, is rarely blocked with ice. Gothenburg handles the largest amount of tonnage, in both domestic and foreign trade. This picturesque port is the landing place for foreign tourists. The city has an excellent university supported by private funds, and technical, nautical, and commercial schools. Population, about 233,000 (1928).

Malmö, *mahlm' uh*, is a seaport town, ranking next in importance to Gothenburg and Stockholm, and lying on the opposite shore of the Sound from



LOCATION MAP

The boundaries of Sweden place it in the rank of one of the small countries of Europe, but its commercial importance is not to be measured by its size.

Copenhagen, in Denmark. It is situated on a level plain and was formerly strongly fortified, but the only fortification now remaining is the citadel where the Earl of Bothwell, husband of Mary Queen of Scots, was imprisoned from 1567 to 1573; this is now used as a prison. Thousands of vessels leave the



Photo: O R O C

THE MIDNIGHT SUN IN SWEDISH LAPLAND

Here for a part of the month of June the sun does not set, and until late in August there is only a short twilight. But, on the other hand, what an opportunity, later, to sleep when the nights are two months long!

feet. This northern section is a region of great forests. Among the deep ravines and steep precipices of the mountains are many long, narrow lakes, whence rise innumerable torrents which scar the long eastern slopes of Sweden, and in the lowland sections widen into broad channels and lakes. Central Sweden is a region of rolling, forest-clad hills, green meadows, and beautiful lakes. In the extreme south lie the fertile plains of Scania, the best agricultural region in the country.

The wooded and rocky coast of Sweden is picturesque, but it has not the rugged grandeur of the fiords of Norway. The entire eastern coast is penetrated by bays and sounds, and is bordered by many islands, which are most numerous near the city of Stockholm. Gotland and Öland, two of the largest islands in the Baltic Sea, belong to Sweden. The coast and islands of the Gulf of Bothnia are rugged, but not lofty. On the Baltic, gleaming white *klints*, or cliffs, alternate with low beaches, but gloomy fields of bare cliffs border the shores of the Cattegat and Skagerrak, and dangerous rocks lurk just below the surface of their waters.

Rivers and Lakes. Most of Sweden's many rivers rise from lakes in the highlands along the Norwegian border, and flow southeast to the Gulf of Bothnia and the Baltic Sea. Among

the largest of these rivers are the Tornea, flowing 250 miles through large lakes and forming the boundary with Russia; the swift Lulea, the Pite, the Skellefte, the Indals, the Dal, and the Angerman, which is navigable for seventy miles by seagoing vessels. The Klar, rising in Norway, flows south to Lake Wenner, and the Göta, the most important commercial river, flows from Lake Wenner to the Cattegat. Six beautiful falls in the latter river, at Trollhättan, furnish 700,000 horse power. Navigation is extended beyond the falls by means of locks, and the river, connecting with canals and lakes, forms a water boulevard across the country (see *Transportation*, below).

The numerous picturesque lakes, bordered by wooded shores, not only furnish some of the greatest beauties of Swedish scenery, but also are of vast importance in navigation, and they abound in fish. The lakes of the lowland region are larger than the mountain tarns. Lake Wenner has an area of 2,114 square miles; Lake Wetter, of 715 square miles. Other large lakes are Hjelmars and Mälars; the latter washes the shores of 1,300 islands, and on its own shore Stockholm, "the Venice of the North," is situated.

Climate. The country occupies the leeward section of the Scandinavian Peninsula, and no

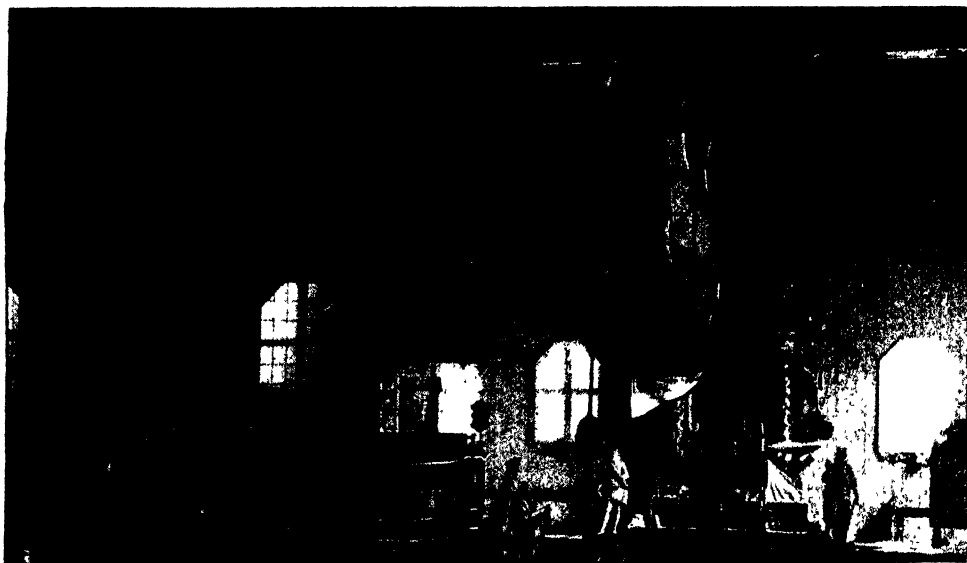


Photo: O R O C

A SHIP MODEL IN A CHURCH

A feature common to many churches in Sweden is a miniature ship, hung from a central rafter. It calls to mind the fact that the ship model originated from the ancient Roman custom of hanging sea-stained garments in the Temple of Neptune as an offering for mercy from the god of the sea. As centuries passed and forms of worship changed, the first miniature ships were made and suspended from the softly lighted arches of old churches. These are known as votive models. The custom described is followed to some extent in Norway.

docks of this busy seaport each year, carrying the city's exports of grain, flour, gloves, chocolate, etc., to many European cities. Malmö is the terminus of eight railway lines. Its town hall is an example of Renaissance architecture of the year 1546. Population, about 117,000 (1928).

Language. The Swedish language is a North-Germanic tongue, and it closely resembles the Danish. It has, however, a more delicate and musical accent than the Danish, and not only the correct pronunciation, but the very meaning of the word, depends upon the accent or variation in the tone of the voice.

Literature. Sweden has produced some of the world's greatest thinkers and literary men, among whom are Bellman, the national poet, Swedenborg, a religious philosopher, and Linnaeus, the naturalist. Swedish literature had its beginning in the written laws of the thirteenth century, and the earliest verse consisted of the popular ballad and folk song of the fifteenth century. The Renaissance and Reformation, which so greatly influenced the literature of continental Europe and England, were scarcely felt in Sweden and Norway. Swedish literature reached its height during the reign of Gustavus III, himself a writer and great patron of learning. This was the age of Bellman, Swedenborg, and Linnaeus. At the close of the nineteenth century, which produced the poets Tegnér, Stagnelius, and Runeberg, the modern spirit of realism swept over Sweden. The greatest writers of the modern period in-

clude Strindberg, the radical dramatist, and Selma Lagerlöf, a novelist, who won the Nobel prize for literature in 1909.

Education. Illiteracy is almost unknown in Sweden. Education is free and compulsory, and an excellent system of elementary and high schools is maintained, under governmental supervision. There are normal, commercial, agricultural, technical, and navigation schools. The universities are at Stockholm, Gothenburg, Lund, and Upsala; the latter, founded in 1477, is one of the oldest universities in Europe. There is also provision for instruction of the defective.

Religion. The Swedish people are very religious, and are much interested in all phases of Christian social work. All but one per cent of the population are members of the Swedish Lutheran Church, which is the State Church. The clergy are supported by the parishes and the proceeds from the sale of Church lands. With the exception of the Mormons, who were expelled in 1912, all denominations are tolerated. Among the dissenters, the Baptists and Methodists are most numerous.

Physical Features. *The Land.* The mountainous sections of Sweden are confined to the northern part of the country, called *Norrländ*, and to the range of rocky precipices and mountains along the Norwegian frontier. The most rugged scenery and highest peaks are in the north, where the lofty, snow-crowned Sarektjokka and Kebnekaise rise about 7,000



Photo: O R O C

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Climate. The country occupies the leeward section of the Scandinavian Peninsula, and no

part of Sweden has so equable a climate as that of Southern Norway, where the seasons are tempered by the Atlantic winds. There is a wide difference between the annual temperature of the northern part of the country, which lies within the Arctic Circle, and that of Scania, which is 900 miles farther south. Winters in the north last nine months, and in the south they are only two months shorter. The seasons of spring and autumn are very short, and in some regions are lacking altogether. At Stockholm the average temperature for July is 62°, and for January 27°. The rainfall averages about twenty inches. It is heaviest during August, and the greatest amount falls in the south. In the northern part of the country, the precipitation rarely exceeds thirteen inches.

Industries. *Agriculture.* Sweden has always been predominantly an agricultural country, but the recent development of manufacturing and other industries has divided the population equally between farmers and factory-workers. The farms are generally small, ranging from five to fifty acres, and are owned by independent farmers. Scania and the Baltic islands are the most productive regions. Much of the marshland in the lowlands is being reclaimed and cultivated. The principal crops are hay and fodder roots, potatoes, sugar beets, oats, barley, wheat, and corn. Barley is the only cereal raised in the north, and the cultivation of sugar beets is largely confined to Scania and Gotland, the latter the most valuable of the Baltic islands.

Southern Sweden is also a rich pastoral region, where cattle-raising and the herding of swine are important; quantities of dairy products are exported to England and Denmark. Small bits of natural pasture are found throughout the country; goats are herded on the hilly slopes, and even in the far north, herds of reindeer find sufficient grazing to keep the nomadic Lapps in food and clothing.

Sweden has attained high efficiency in agriculture. It has a state department devoted to its development, and maintains many agricultural schools and societies. Horticulture is also important; there are large botanical gar-

dens at the universities, and nurseries are maintained by the government. Primitive methods of cultivation are now seen only in isolated districts.

Forests. More than one-half of Sweden is timberland, and the extensive forests constitute the main natural wealth of the country. The uplands and mountains are clothed with dense growths of pine, spruce, birch, and mountain ash; thick groves of oak border the low-

land lakes, and beech forests separate the cultivated fields of Scania. The greater part of the woodland areas belongs to the Crown and is controlled by a well-organized forest service. Excessive cutting of timber and other abuses characteristic of America are prevented by law, and trees are grown faster than they are cut. An extensive area in the north has been made a national park, where hunting and logging are prohibited. There is an institute of forestry at Stockholm, and other minor forestry schools are maintained by the government.

Fisheries. The calm waters of the sea inlets are excellent fishing

grounds, and sea fishing has long been one of Sweden's principal industries. Herring is the most important product, and there are large salmon fisheries in the mouths of the northern rivers. Sweden's export of salt and canned fish is not as large as that of Norway, and in recent years the annual catch has decreased in value. There are not nearly as many fish in Swedish as in Norwegian waters [see the article *NORWAY (Fisheries)*].

Mining. Sweden's mines are one of its chief sources of wealth. The northern and midland regions are especially rich in iron; with the introduction of modern machinery, the development of the mines has been rapid. Swedish iron ore is noted for its purity, and it excels that of any other European country. Millions of tons are exported annually. Copper, formerly mined extensively in Falun, has fallen off considerably in production. Deposits of silver, coal, lead, zinc, and sulphur pyrites are found in various parts of the country. There are schools of mining at Stockholm, Falun, and Filipstad.



Photo: O R O C

COMMON IN WINTER

Swedish girls making their way through the heavy snows of winter by means of poles and skis.

Manufactures. The vast power furnished by the southwestern rivers is being utilized for the development of large manufacturing industries. Factories are scattered throughout the small towns and rural districts, and a great many of the employees live in the country. In the north, especially along the Gulf of Bothnia, are numerous sawmills. Lumber and timber products, including furniture, wood pulp, paper, and pasteboard, are the chief manufactures of Sweden. There are large iron-smelting plants and foundries in the midland districts, and the porcelain and glass factories, flour and woolen mills, sugar refineries, leather and rubber plants, chemical factories, and electric and gas plants are also important. Trollhättan, Norrköping, Stockholm, and Gothenburg are the chief manufacturing cities.

Transportation and Commerce.

Besides many excellent roads and about 10,110 miles of railroad, Sweden has 2,500 miles of inland waterway afforded by the many rivers, canals, and lakes. The Göta River, Lake Wenner, and smaller lakes and canals form a continuous thoroughfare from the Skagerrak to the Baltic; a total of only fifty-six miles of this consists of artificial canals, and in it there are fifty-eight sets of locks. As the Baltic Sea was unsafe for traffic during the World War, new railroad lines between Swedish cities and Russian ports were opened in 1915, and a railroad now encircles the Gulf of Bothnia, affording transportation from Stockholm to Leningrad. The rivers provide not only transportation, but also electrification for railways.

The commerce of Sweden is extensive for a country of its size, and its large merchant marine, consisting of over 2,500 ships since the end of the World War, carries much foreign

as well as domestic trade. Since 1911 there has been a uniform tariff on all Swedish imports, and a national trade-mark, adopted by the General Commercial Association of Sweden, is placed on all Swedish exports. The chief imports are coal, metal goods, machinery, raw textiles, and foodstuffs, and the principal exports are timber products, paper, iron, livestock, and dairy products. The chief ports are at Gothenburg and Stockholm, but Malmö and Helsingborg are also important.

Government.

Sweden is a constitutional monarchy. The Constitution was adopted in 1809, and has been several times amended and modified. The executive power is vested in the king, who must be a member of the Lutheran Church. He is assisted by an administrative Council of State. The right to make laws is vested in the Diet, which consists of two chambers. In the upper chamber there are 150 members, elected for eight years by the municipal and provincial councils, or *landstings*. The second chamber consists of 230 members, elected for four years by universal suffrage.

The administration of justice is independent of the government. It is controlled by the Chancellor of Justice; he is appointed by the king and represents the Crown; the Attorney-General, who is appointed by the Diet, has general supervision over all courts.

Local Government. There is a high governor at Stockholm and a prefect, nominated by the king, in each of the twenty-four provinces. In all communes and municipalities, women taxpayers as well as the men have the vote, and are eligible to communal office. The communal assemblies and city councils decide all questions of local administration. Religious affairs and elementary education are controlled by parish assemblies. Liquor traffic is rigidly



Photo: O R O C

NATIONAL COSTUMES

Picturesque are the caps, bodices, and aprons of these girls of Central Sweden. Red, white, and black predominate in the colorful aprons.

controlled by the government. Spirits may be sold only by responsible societies, and the profits go to the municipality.

History. *Early Growth of the Kingdom.* Much of Sweden's history before 1000 A.D. is



Photo: O R O C

PUBLIC TELEPHONE BOOTH

The booth shown is typical of those found everywhere in Sweden. Sweden has more telephones in proportion to population than any other country except the United States. The telephone system is government-owned.

legendary. Christianity was introduced in the middle of the ninth century, but was not fully established until the eleventh century, during the reign of Olaf, who defeated Norway and made Sweden the mightiest kingdom in the

north. During the next 200 years, Sweden's history is a story of the warfare between the Swedes in the northern part of the country and the Goths in the south, and between both of these peoples and the Danes. About the middle of the twelfth century, the government and the Church were organized, and under the kings Sverker, Eric IV, and Charles VII, Sweden's political and economic development began.

In 1397, by the Union of Kalmar, Queen Margaret of Denmark and Norway united Sweden with the other two Scandinavian countries under one rule [see NORWAY (History)]. The Swedes were restive under the predominance of Denmark, and in 1523 they broke away from the Union and elected Gustavus Vasa king of Sweden. During the reign of this great sovereign, the Reformation spread to Sweden, and Lutheranism was made the State religion. From this time, development was rapid, though prosperity was temporarily disturbed by the religious struggles of the succeeding reign.



HOW SWEDEN DECREASED IN SIZE

This map shows how Sweden, once the first military power in Europe, has lost territory from time to time. (A) Present area of Sweden; (B) Norway, lost in 1905; (C) Finland, lost in 1809; (D) area lost in 1721; (E) Western Pomerania, lost in 1814.

Sweden Becomes a Great Power in Europe. Under Gustavus Adolphus (1611-1632), Sweden became one of the greatest European military powers and commercial countries. This king's ambition for territorial expansion

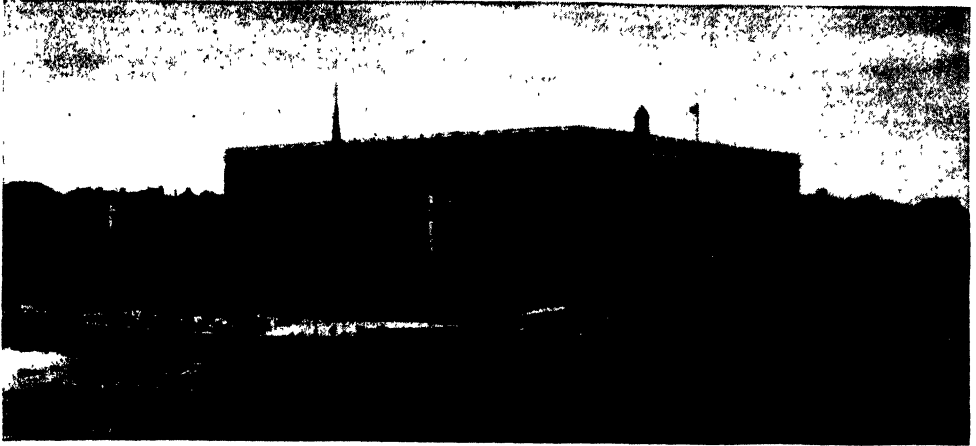


Photo: O R O C

THE ROYAL PALACE IN STOCKHOLM

An impressive group of buildings in the Renaissance style, built around a large square court. Besides being the residence of the royal family, it contains art collections of great value.

and his Protestant faith drew him into the war in Germany. The policy of Gustavus



Photo: O R O C

"THE SWEDISH NIGHTINGALE"

A statue of Jenny Lind, in a park in Stockholm.
[See LIND, JENNY.]

Adolphus was continued after his death; new territory was acquired, and for some years Sweden was recognized as a great power, but

in 1675 its forces were completely defeated by Frederick William of Brandenburg, its sea power was lost, and ruin was only averted by the treaty of peace.

The eyes of all Europe were again turned on Sweden during the reign of Charles XII, who invaded Denmark, Poland, Russia, and Norway. Following his death, Sweden was weakened by political struggles, and even Gustavus III (1771-1792), who wiped out the factions and increased the royal power, was unable to restore Sweden to its former prosperity.

Relations with France. Charles XIII (1809-1818), having no heir, chose Bernadotte, one of Napoleon's marshals, as crown prince. Bernadotte joined the allied powers in the final overthrow of Napoleon, and, as a reward for this support, Norway in 1814 was transferred to Sweden from Denmark, for the latter country had united with Napoleon. Bernadotte came to the throne in 1818 as Charles XIV John, and during his reign and those of the succeeding kings, Sweden prospered.

Recent History. In 1905 King Oscar II refused to give Norway a separate consular service. Norway then declared its independence, but preserved friendly relations with Sweden. Two years later, Gustaf V succeeded to the

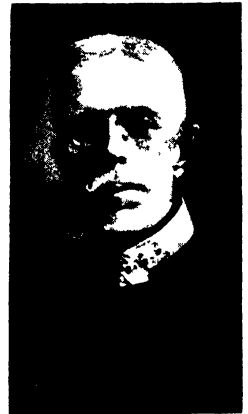


Photo: U & U

KING GUSTAF

OUTLINE AND QUESTIONS ON SWEDEN

Outline

I. Location

- (1) Latitude, $55^{\circ} 20' 18''$ to $69^{\circ} 3' 21''$ north
- (2) Longitude, $11^{\circ} 6' 19''$ to $24^{\circ} 9' 11''$ east
- (3) Boundaries
- (4) Relation to other countries

II. Size

- (1) Length
- (2) Breadth
- (3) Actual area, 173,000 square miles
- (4) Comparative area

III. The People and Cities

- (1) Population
 - (a) Increase in spite of emigration
- (2) Racial peculiarities
- (3) Language and literature
- (4) Religion
- (5) Education
- (6) Cities

IV. Geographic Features

- (1) Coastal peculiarities
- (2) Mountains
 - (a) Location
 - (b) Greatest heights
- (3) Rivers
 - (a) Canal connections
- (4) Lakes
 - (a) Economic importance
- (5) Climate
 - (a) Moderating influences
 - (b) Differences due to latitude

V. Resources and Industries

- (1) Agriculture
 - (a) Regions where it is practiced
 - (b) Chief crops
- (2) Forests
- (3) Fisheries
- (4) Mines
- (5) Manufacturing

VI. Transportation

- (1) Railroads
- (2) Rivers and canals
- (3) Commerce

VII. Government and History

- (1) Form of government—constitutional monarchy
 - (a) Executive
 - (b) Legislature
 - (c) Judiciary
 - (d) Local government
- (2) History
 - (a) Early years
 - (b) Union with Denmark and Norway
 - (c) Sweden at the height of its power
 1. Gustavus Adolphus
 2. Charles XII
 - (d) Napoleonic Era
 - (e) Later nineteenth century
 - (f) Separation from Norway
 - (g) World War
 - (h) Later history

Questions

- What is meant by the expression "fresh-water archipelago" as applied to Sweden?
- How does the outer coast line of Sweden compare with that of Norway in length?
- How do the two compare if all the indentations are counted?
- What Swedish author won the Nobel prize, and when?
- How long is a summer day at Stockholm?
- How long is a summer day in the most northern part of the country?
- What are the *klints*, and where are they to be found?
- What is "the Venice of the North," and why is it so called?
- Why is the climate more extreme than that of Norway, which is in the same latitude?
- What king raised Sweden to a place of power among the nations of Europe?
- Why did Norway separate itself from Sweden?
- How was Sweden affected by the World War?
- What marriage indicated the friendly feeling now existing between Norway and Sweden?
- In the churches, what are "votive models"?

SWEDEN



Gustavus Adolphus



Peasant Children



Coat of Arms

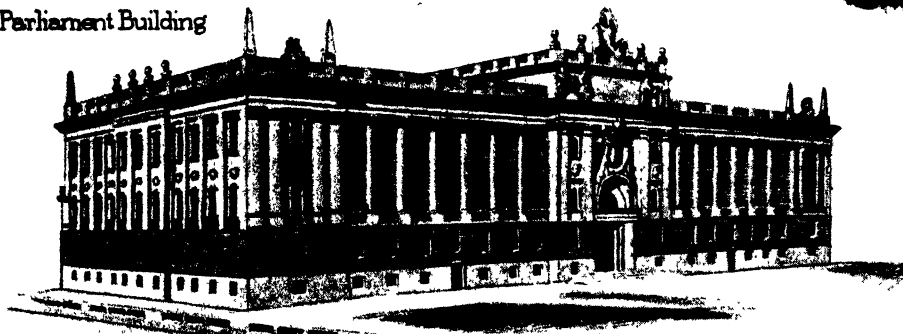


Ice boat race

Swedish
Peasant
and
Wife

Ski-ing

Parliament Building

Pulp mill
on Gota canal

Lutheran Cathedral, Uppsala



throne. Sweden remained as neutral during the World War as its position made neutrality possible, although its commerce and industry suffered, and its neutral rights on the sea were violated. In 1915 Sweden prohibited the export of arms and munitions to the belligerent nations, and protested against Germany's submarine warfare and England's use of neutral flags. In June, 1915, friendly relations were established between Sweden and its old enemy, Russia, with regard to financial, commercial, and industrial interests.

Notwithstanding its neutrality, Sweden suffered more hardships than many of the fighting countries, for its shipping, when not imperiled by the mines and submarines of the North Sea, was cut off entirely by blockades. Thus food necessary for the people and the animals could not be imported, nor fuel and raw materials to supply the industries, and, of course, all foreign trade was cut off.

Industry was paralyzed, unemployment rampant, and actual necessities became alarmingly scarce. The government found it necessary to prorate sugar, bread, potatoes, milk, coffee, etc., to fix maximum prices on other commodities, to provide insurance against loss at sea, to control the merchant service, and to establish commissions to take care of trade and the unemployed.

Since the war, industry has made great progress, and recent social and economic reforms have placed Sweden among the foremost nations of the world. A trade agreement with Russia was concluded in 1924, and arbitration councils were established with the other Scandinavian powers by 1925.

In the summer of 1920, a colony of 900 Swedish villagers who had lived in the South Russian community of Gammalsvenskby moved as a body to Sweden, where they found homes in the agricultural sections. For more than 150 years, Swedish people had lived in this Russian village, and had maintained their language, religion, and customs. In 1929 Olaf, crown prince of Norway, married Princess Martha, of the Swedish royal house. W.B.

Related Subjects. The reader who wishes more detailed information will find it in the following articles in these volumes:

COAST WATERS

Baltic Sea
Bothnia, Gulf of

Cattegat
Skagerrak

HISTORY

Charles (IX, X, XI,
and XII)
Denmark (History)
Gustaf V

Gustavus (I, II, III, and
IV)
Norway (History)
Oscar (I and II)
Thirty Years' War
World War

LEADING PRODUCTS

Herring
Iron
Lumber
Rye



THE FUTURE RULERS OF SWEDEN

Crown Prince Gustavus Adolphus and Crown Princess Louise Alexandra.

SWEDENBORGIANS, *swe den-baw'r' jih anz*, the religious sect that accepts the teachings of Emanuel Swedenborg. Between 1782 and 1788, his followers organized, in London, the New Church, or the New Jerusalem Church. Their belief, as set forth in Swedenborg's writings, regards the universe as one whole, the outward world being the counter-

part of the inner and spiritual. Beneath the literal meaning of the Bible is the spiritual meaning, which is open to those who have inner discernment. Justification is not attained by faith alone, but whoever fears God and works righteously shall be saved. God is one and the real Trinity is in Christ. The last judgment has already taken place, and the New Jerusalem has descended in the form of the New Church. There is no physical resurrection, but at death men's eyes are opened to the spiritual world, of which they are already a part. They are drawn to heaven or hell by their own affinities. Angels are the spirits of departed human beings.

The first Swedenborgian Church in the United States was organized in Baltimore, in 1792. The American societies are grouped into state organizations called associations, and the General Convention of the New Jerusalem Church is composed of twelve of these associations, and of seven separate societies. There is a smaller organization of the sect, known as the General Church of the New Jerusalem.

Emanuel Swedenborg (1688-1772), scientist, philosopher, and religious enthusiast, was born in Sweden,

the son of a Lutheran bishop. Intended for a teaching career, he studied the sciences in England, and later wrote the first algebra ever published in Sweden.

In 1745 he turned to religion and developed the system now held by the Swedenborgians. Swedenborg never preached, and had no intention of organizing a new religious sect, for he believed that members of any church might benefit from the teachings of the New Church, without severing their existing affiliations, and therefore no separate organization was necessary. It was not until ten years after his death that any attempt was made toward organization, and even now many of his followers have continued to maintain their original church connections.



Photo: Brown Bros.

SWEDENBORG

SWEDISH NIGHTINGALE, a name applied to Jenny Lind (which see).

SWEET ALYSSUM, *a lis' um*, a low, spreading plant of the mustard family, bearing clusters of tiny white flowers, and having four-sided stems which contain a bitter juice. It is a hardy little plant, blooming until late in the fall, and is often used as a border for gardens and flower beds. There are single and double varieties; some are dwarfed, and others grow eight or ten inches high. Sweet alyssum is easily raised, for it grows from seeds or cuttings, and thrives in any reasonably fertile soil.

B.M.D.

Scientific Name. Sweet alyssum belongs to the family *Cruciferae*. Its botanical name is *Lobularia maritima*.

SWEET BAY. See LAUREL; MAGNOLIA; BAY TREE.

SWEETBREADS, certain glands in the calf which are esteemed as an appetizing food. There are two kinds, *neck sweetbread* and *stomach sweetbread*, the first being the thymus gland, and the second the pancreas. The latter is the more easily digested, and can be assimilated in less than half the time required for an equal amount of beefsteak. Great care should be taken in the preparation of the sweetbreads, in order to make them palatable and appetizing. They should first soak in cold water for two and one-half hours; this water is poured off, and fresh, cold water placed in the pan, which is then brought to a boil on the stove. Boiling is allowed to continue for five minutes, after which the sweetbreads are again placed in cold water, to preserve their color. Now the fat and skin are carefully picked out, and when this process is completed, the delicacy is ready to cook. Braise for one hour

with meat stock and vegetables; then transfer to an oven and allow to brown. Sweetbreads may then be served with any sauce the taste may dictate. See PANCREAS.

SWEETBRIER. See EGLANTINE.

SWEET CHERVIL. See CICELY, SWEET.

SWEET CICELY. See CICELY, SWEET.

SWEET CLOVER. See MELILOT.

SWEET FLAG, a tall, reedlike plant of the arum family, which grows along brooks and in marshy places in almost all parts of the northern hemisphere. Its stiff stems are tipped by spikes of green blossoms, and it has flat leaves shaped like a two-edged sword. They spring directly from the tuberous rootstock, and grow to be two feet long. This rootstock is the calamus root of the apothecary. It has tonic properties, and is also used in the manufacture of perfume, hair powder, and other toilet preparations. In Europe it is sliced, sugared, and eaten as a confection.

B.M.D.

Scientific Name. The sweet flag belongs to the family *Araceae*. Its botanical name is *Acorus calamus*.

SWEET LOCUST. See HONEY LOCUST.

SWEET OIL, formerly a popular name for olive oil (which see).

SWEET PEA, a favorite garden plant belonging to the same family as the edible pea. It is cultivated for the beauty and exquisite fragrance of its flowers, which are colored blue,



SWEET PEAS

red, purple, pink, and white, and in shape suggest the butterfly. In the year 1699, seeds of a white variety were sent to England from Sicily, and since that time numerous varieties have been developed by gardeners and florists in various parts of the world. In some varieties,

the flower petals are smooth and velvety; in others, they are crinkled and wavy. There are two general types—the tall-growing and the dwarf. The former, which is the more popular, produces a rough, hairy stem that climbs by tendrils and needs support.

Cultivation. Successful cultivation of the sweet pea requires a rich, well-drained soil, plenty of sunshine, and free circulation of air.

The seed should be sown in April, in the proportion of one ounce to thirty feet of row; plants should be at least two inches apart in the row, and the rows separated by four feet of space. As soon as the plants appear above ground, cultivation should begin. The soil should be stirred lightly at least three times a week, preferably after a rain, and the rows should be kept free of weeds.

Application of liquid manure and free watering of the plants are necessary. Watering should be done as often as required, and liquid manure, which is plant food, should be applied at least six times during the season. This plant food can be secured by putting a wheelbarrow load of cow manure in a barrel, and filling the barrel with water.

Keep the barrel covered, to prevent the entrance of insect pests. Stir the liquid three or four times, and then allow it to stand for a week. Then remove the froth from the top, and dilute the mixture until it is the color of very weak tea.

The liquid should be poured into a trench dug three inches deep and four inches from the vines. The accompanying diagram shows how



DIAGRAM

Showing how to plant and stake the sweet pea. (a), one foot of manure and soil; (b), one foot of fine garden loam; (c), nodules on roots of pea plant; (d), the seed planted (summer) one inch deep in a furrow two inches below the surface edge of the trench; (f), surface soil to be leveled in as the plant grows; (g), furrow in which to apply liquid manure; (h), pea vine clinging to wire support; (i), wire, 4-inch mesh or chicken wire; (k), iron support.

to prepare the stakes for the vines. The flowers should not be permitted to seed, but should be picked as they mature. B.M.D.

Scientific Name. Sweet peas belong to the family *Leguminosae*. The common garden species is *Lathyrus odoratus*.

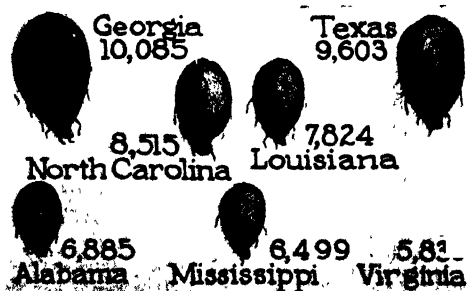
SWEET POTATO, a plant belonging to the same family as the morning-glory, with long, creeping stems and heart-shaped leaves. It is



WHERE SWEET POTATOES GROW

Where the dots are most numerous, the yield is greatest

cultivated for its sweet, edible roots, whose resemblance to the common potato gave the plant its name. The edible part of the sweet potato, however, is a yellowish- or reddish-skinned root and not a stem or tuber, as in the case of the common potato. The two plants belong to different families (see POTATO). There are two general classes of sweet-potato roots, with yellow and white flesh, respectively, but the yellow varieties are the most common.



PRINCIPAL CENTERS OF PRODUCTION

The figures represent the average crops for three successive years.

The flesh is rich in starch and sugar, and is wholesome and digestible.

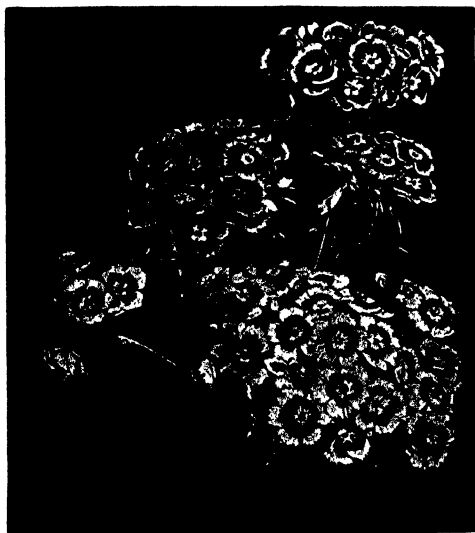
The plant is probably a native of America, but is now cultivated in warm countries all over the world. The most important sections in the United States, as may be seen from the

accompanying diagram, are in the Southern states near the coast. In total production, the sweet potato ranks next to the white potato among American vegetable crops. Sweet potatoes thrive best in a warm, well-drained soil, and when the plants have gained a good start, they need little rain. They are grown from slips produced from roots, or from vine cuttings. The roots are usually harvested before frost, and will keep indefinitely if stored in a warm, dry place. B.M.D.

Scientific Name. The sweet potato belongs to the family *Convolvulaceae*. Its botanical name is *Ipomoea batatas*. It is a different plant from the yam, though the two names are sometimes confused. See YAM (Scientific Names).

SWEET SCABIOUS, *ska' bih us*. See FLEABANE.

SWEET WILLIAM, one of the oldest garden flowers, a member of the pink family, ranging in color from white to dark red and purple. The fringed, velvety blossoms are crowded together in dense clusters at the ends of the stems; each cluster may be of one color,



SWEET WILLIAM

or a single stem may contain flowers of varied hues and markings. Sweet Williams grow readily from seed, in ordinary garden soil. Since the plants are biennials (which see), seedlings should be raised each year, to make sure of a continuous supply of flowers. See PINK. B.M.D.

Scientific Name. The sweet William belongs to the family *Caryophyllaceae*. Its botanical name is *Dianthus barbatus*.

[For the wild sweet William, a different plant entirely, see PINK.]

SWIFT, a small bird with strong, flexible wings, but weak feet, various species of which are found in practically every part of the world. In color it is a sooty-brown or a greenish-black, some species having white throats or rumps. Swifts fly tirelessly all day, capturing their insect food while on the wing, and seldom alighting. At dusk, performing many graceful evolutions as they fly, they return to



Photo: Visual Education Service

THE CHIMNEY SWIFT AND ITS NEST

the chimney, cave, cliff, or hollow tree, where they live in colonies or roost in flocks. Their notes, continuously repeated, are little more than chatterings. They build curious nests, in which sticks, leaves, etc., are cemented together with saliva, some being almost entirely composed of saliva, as the edible birds' nests of Eastern Asia. See EDIBLE BIRDS' NESTS.

The common American swift, a bird of Eastern North America, has been forced almost entirely to the chimney as a home, and is generally called *chimney swift* or, erroneously, *chimney swallow*. In perching, it clings to the wall with its feet, bracing itself with its spine-pointed tail. It breaks off the twigs for its nest with its beak, as it flies. The nest is semi-circular in form, firmly cemented to the inside walls of some chimney not used during summer. The eggs are white in color and four to six in number. Two broods are usually reared in a season. Swifts are highly beneficial birds, as they feed wholly on insects. D.L.

Scientific Name. The swifts constitute the family *Micropodidae*. The chimney swift is *Chaetura pelagica*.

SWIFT, EURASIAN. See BIRD (Flight).

SWIFT, JONATHAN (1667-1745), an English satirist and clergyman, born in Dublin. He was unusually advanced as a child—could spell at three, and at five could read any chapter in the Bible. At the Kilkenny School, and later at Trinity College, Dublin, where he was poorly supported by the charity of an uncle, his course of study was most irregular. History and poetry appealed to him, and he read them greedily, but for the set course of study he had nothing but scorn. In consequence, it was only by special favor that he obtained his degree. During the Revolution of 1688, he fled to London.



JONATHAN SWIFT

Early Discouragements. At twenty-one he became secretary to Sir William Temple, of Moor Park, Surrey, at a salary of twenty pounds (\$100) a year. He was treated much as a servant, but though his pride was hurt, he retained his office for five years, finding some solace in the fact that he had much time to devote to study and writing. In 1694, in an attempt at independence, he accepted a small parish in the Irish Church, in a distant, secluded place, but his dissatisfaction was deeper than before, and in a short time he returned to the Temple household. Here he remained until Sir William's death. In Temple's family he became acquainted with a beautiful girl, Esther Johnson, who was to play so important a part in his life, and whom he made famous as the "Stella" of his writings.

His Literary Career. In 1699 Swift attended the Earl of Berkeley as secretary and chaplain on a journey to Ireland, and was made vicar of Laracor and Rathbeggan. During all his clerical career, he engaged in political writing, and in 1704 won wide fame on the publication of his *Tale of a Tub*, a humorous and forceful satire on insincerity and pedantry in literature and in theology. Such a work could not, however, fail to injure his chances for preferment in the Church. In the decade that followed, he became a conspicuous figure in politics. Beginning as a Whig, he became so opposed to the principles of his party that, in 1710, he turned from it entirely, making plain the change by accepting the editorship of the Tory *Examiner*. Through his essays, he exerted a strong influence on the trend of public thought, but in 1714 he shared the Tory loss of power, and was forced to content himself with an appointment to the deanery of Saint Patrick's, Dublin.

During his residence in Ireland, previous to 1710, Swift had urged Miss Johnson and her friend Mrs. Dingley to make their home near him, and thus he enjoyed a continuance of his early friendship. While he was in England, from 1710 to 1713, he wrote the letters that compose the *Journal to Stella*, a work of deep biographical interest. In the same period, he became involved in a connection with Miss Hester Vanhomrigh which caused him great embarrassment and resulted tragically. Upon his departure from England, the young lady, driven by her love for him, followed him and settled near him in Ireland, and by some secret communication learned of his friendship for Stella, to whom she finally wrote. Having thus incurred Swift's anger, Miss Vanhomrigh died of the grief caused by the rupture of their friendship (1723).

In the year following this unfortunate affair, Swift won the lasting esteem of the Irish people by issuing the *Drapier Letters*, in which he vigorously opposed the granting of a patent for copper coinage in Ireland. Two years later appeared his *Gulliver's Travels* (which see), a highly amusing satire on human nature. He persisted in his efforts to lighten the wrongs of the Irish, until, in 1742, the fate that he had long dreaded came upon him, and he became insane. His affliction continued until his death. See pages 6963-6964.

SWIMMING. Every boy and girl should learn to swim, for the following reasons:

1. In case of accident on the water, ability to swim may enable one to save his own life, and possibly the lives of others.
2. Swimming affords one of the best means of developing the muscles and invigorating the system.
3. Swimming is a delightful recreation.

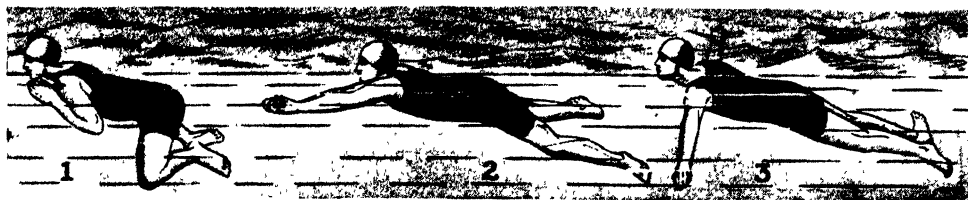
Notwithstanding the importance and value of this art, it is probable that not over one-third of the people know how to swim. Yet it is nearly as easy for a person to learn to swim as it is for a child to learn to walk; it is said that the babies of the South Sea islanders can swim before they have learned to walk.

Preliminary Steps. The first step toward learning to swim is to overcome fear of the water. Select a place where the water is clear and free from currents and weeds, with the bottom sloping gradually. Wade out slowly until the water reaches the waist. Take a deep breath, then bend the legs until the head is under the water. Open the eyes and look at the bottom for a second or two, then rise to a standing position. Repeat the exercise until the head can be submerged with confidence.

Having learned that you can place your head under water for a few seconds, you are ready for the next preliminary step, which consists in learning to lie in the water and float. Wade out to where the water is waist deep, face the shore, take a deep breath, incline the body







THREE POSITIONS DEMANDED BY THE BREAST STROKE

slowly, stretching the arms out straight with the palms down. As the arms and head strike the water, the feet will rise. Straighten the legs, and you will be able to lie in this position several seconds without sinking, if you do not attempt to raise the head. Paddle gently with the hands. You will see that you are moving toward the shore.

The human body as a whole is lighter than water, but some parts of it, particularly the head, are heavier than water. Consequently, when the head is partially supported in the water, it is much easier to float.

Probably several exercises may be necessary to enable you to lie in the water with confidence, but you should gain this confidence before attempting to swim.

The Breast Stroke. The breast stroke is considered the simplest swimming stroke, and the one that is usually taught to beginners. While an instructor is of great advantage, one may learn to swim by himself. In so doing, the following suggestions will be found helpful:

Before going out into deep water, the beginner should practice the strokes, either on land, by lying over a box or narrow bench, or in shallow water. It is especially important that the beginner learn the leg stroke before attempting to swim in deep water; otherwise, he will very likely attempt to pull along the entire weight of his body with his arms, thus causing great fatigue. The leg stroke may be learned by holding to a boat, wharf, or edge of a pool.

The scissors kick is most generally favored by experts for breast and side-stroke swimming. It is a froglike kick. In the beginning, the legs are stretched straight out with heels together; then:

First position: the feet, still together, are drawn up close to the body, and the knees are bent outward;

Second position: the legs are straightened and the feet are thrown out wide;

Third position: the feet are brought together with force. The force of this snapping the feet together sends the swimmer swiftly through the water.

The arm stroke, which is used in unison with the kick, both propels and acts as a lever to support the head out of the water. It is well to remember, though, that the more completely one is submerged, the lighter the weight. When beginners have acquired the ability to float face downward, previously described, it is easy to practice the leg stroke with the face under water and the arms outstretched.

Then the arm stroke may be combined, with the head raised, the nose just above the water.

When the legs are in the first position (see illustration), the hands are placed palms together on the chest; as the feet are thrown apart, the arms are straightened, as in the second position; then, as the feet snap together, the hands are turned outward and the arms are pulled back in a wide, sweeping arc; then elbows bend and the hands follow close to the body.

Counting is a great help in learning to swim, especially as it keeps the stroke even. One of the important things to learn is to *float between the strokes*; that is, to stroke slowly and with ease.

Other Strokes. One who has mastered the breast stroke will have little difficulty in learning what is known as the *back stroke*, which is the stroke used in swimming on the back. Instead of keeping the arms in the water, as in the breast stroke, the swimmer lifts them into the air and carries them in a sweep beyond and in front of the head, with the palms kept upward. Then the palms are given a half turn and the arms sweep around. As they begin this latter movement, the legs are drawn up, as in the breast stroke. The force of the kick which follows propels the body along as the arms are being extended for their next stroke.

The *side stroke* carries the body forward on its side. It is better to lie on the right side, for the heart action is more likely to be unimpaired and the leg action is freer. The leg kick is practically the same as in breast-stroke swimming, but the arm stroke is entirely different. As the right arm swings out before the swimmer, the left pulls back, and *vice versa*. Each arm makes a circular motion, the right swinging out, down and up, close to the body, and the left swinging from the right shoulder outward, toward the left hip. The legs are opened wide, then swung together as the left arm is extended, and the right arm finishes its downward stroke. A variation of the side stroke, the over-arm (single or double), is used for speed.

The *crawl*, or *Australian crawl*, was adapted from the South Sea islanders; it is a comparatively new stroke in America and Europe. In executing the crawl, the swimmer lies flat upon the water. The legs from the knee to the feet are alternately raised above the water halfway to the knee, and are brought down with all possible force, one leg at a time. The arms are bent at the elbows, the hands entering the water just in front of the head; they are then

FIVE POPULAR SWIMMING STROKES

ELBOW OF HIGH ARM →
RELAXED DURING RECOVERY
CRAWL STROKE
INHALING THROUGH MOUTH
WATER LINE UNDER EYES

STRAIGHT UP-AND-DOWN KICK
RELAXED KNEES
LEGS MOVE FROM HIPS
STRAIGHT ARM DOWNWARD PULL
EXHALING THROUGH NOSE UNDER WATER

SIDE STROKE

IN SIDE STROKE, HANDS DO NOT REACH ABOVE WATER AT ANY TIME DURING ACTION.
BODY LIES ON ONE SIDE
SCISSORS KICK

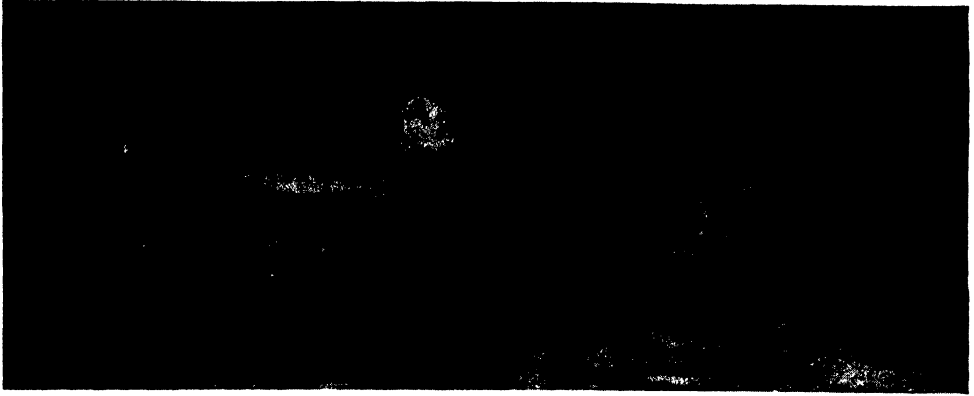
SINGLE AND DOUBLE OVERARM STROKES

IN SINGLE OVERARM STROKE, ONLY ONE ARM REACHES ABOVE WATER DURING ACTION.
BODY LIES ON ONE SIDE

IN DOUBLE OVERARM STROKE, BOTH ARMS REACH ABOVE WATER ALTERNATELY.
BODY ROLLS FROM SIDE TO SIDE DURING ACTION

FROG KICK

BREAST STROKE
AS SEEN FROM ABOVE



ILLUSTRATING THE BACKSTROKE

pushed sharply back, and come out of the water near the hips. When the right arm is dipped, the left leg is brought down, and *vice versa*.

The breast stroke and the three strokes explained above are the most popular with swimmers of all nations. The art of diving is explained in a separate article. See DIVING.

Breathing. Next in importance to a proper stroke is proper breathing. An expert teacher of swimming says:

To nothing else so much as breathing is due the inability of those who can swim to keep up the speed and regularity of movement for an indefinite period.

In swimming, the breathing should be directly opposite from what it is out of the water. A quick, deep inspiration should be taken through the mouth, and the air should be exhaled slowly through the nostrils, and this should be done at each stroke.

Use of Artificial Aids. If one must learn to swim in deep water, artificial aids (which include inflated belts, bags, or "wings," belts to which a rope and pulley are attached, planks, cork mattresses, and the like) are a necessity, but to one who has the advantage of shallow water, these devices are of doubtful benefit. While a beginner may learn the strokes more quickly if he uses an artificial device, there is great danger that he may form the habit of relying upon it, and not become an independent swimmer. Such devices as inflated belts or wings hinder in overcoming fear of water and in acquiring self-confidence.

E.U.G.

SWINBURNE, *swin' burn*, ALGERNON CHARLES (1837-1909), an English poet, born in London. His father was Admiral Charles Henry Swinburne; his mother was Lady Henrietta, a daughter of the third Earl of Ashburnham. He was educated at Eton and at Oxford, where, however, he did not complete his course. In 1860, the year that he left the university, he published *The Queen Mother* and *Rosamond*, both modeled on the Elizabethan drama; but

though they were very remarkable for the work of so young a poet, they attracted little attention. In the same year, he made a short continental tour, during which he met Landor, at Florence.

In 1865 Swinburne's genius for the first time became recognized, when *Atalanta in Calydon*, a tragedy of exceptional metrical beauty, was published. Not long afterward appeared his *Poems and Ballads*, which brought upon him vigorous censure, because of his revolt against conventional morality. The wonderful melody of the verses could not be denied, however, and it might almost be said that Swinburne, like Byron, became famous in a night. A number of political songs and odes followed, including *A Song of Italy*, *Ode on the Proclamation of the French Republic*, *Songs before Sunrise*, and *Songs of Two Nations*. In 1881 was completed a trilogy begun in 1865, of which Mary, Queen of Scots, is the subject, the three parts being *Chastelard*, *Bothwell*, and *Mary Stuart*.

Additional Works. Of his other poems may be named the tragedy *Erechtheus*; a second and a third collection of *Poems and Ballads*; the odes addressed to Victor Hugo; *Tristram of Lyonesse*; *A Century of Roundels*; the tragedies *Lochine* and *Rosamund*, *Queen of the Lombards*; *The Tale of Balin*; and *Astrophel and Other Poems*.

SWINE. See HOG.

SWINTON, WILLIAM (1833-1892), a Scottish-American educator, and author of widely used textbooks, was born at Salton, in Scotland. When he was ten years old, he emigrated with his parents to America, and was educated at Knox College, Toronto, and at Amherst College, Mass. He taught at girls' schools in North Carolina and New York, and in 1858 became a member of the staff of the New York *Times*. During the War of Secession, he was with the Army of the Potomac as correspondent.

In 1869 Swinton was appointed professor of belles-lettres in the University of California,

but five years later resigned and devoted himself to the preparation of textbooks. His spelling and language books, histories, and geographies were more widely used than almost any other books of his day, and he was awarded various honors for them.

Other Works. He wrote *Rambles among Words*, *Campaigns of the Army of the Polomac*, and *The Twelve Decisive Battles of the War*, and edited *Masterpieces of English Literature*.

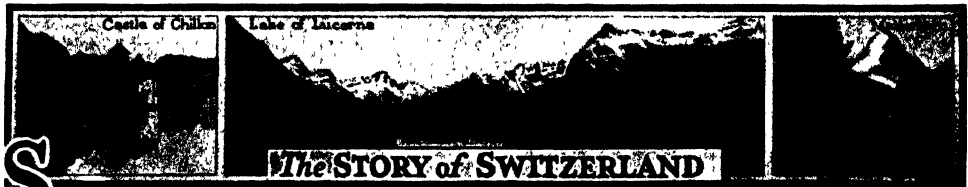
SWISS CHARD. See CHARD.

SWISS GUARDS. a famous body of Swiss soldiers, organized to protect King Louis XIII of France, in 1616. For over 175 years, the Guards were in service, until annihilated by the infuriated populace during the attack on

the Tuilleries, August 10, 1792. Their courage and devotion to duty is commemorated in the famous "Lion of Lucerne," carved in the face of a rock at Lucerne, Switzerland (see SWITZERLAND, for illustration). This monument is simply and pathetically dedicated "To the Fidelity and Courage of the Helvetians." In 1815 a corps of Swiss Guards was reorganized by Louis XVIII, but they were defeated and dispersed in the Revolution of 1830.

The Pope of Rome maintains a bodyguard of Swiss known as the Papal Guard, composed of picked men possessing the well-known Swiss qualities of courage, intelligence, and fidelity.

SWITCHBOARD. See the article TELEPHONE, subhead.



SWITZERLAND, a land whose serene beauty of majestic mountains, exquisite lakes, and green valleys remains unspoiled by busy cities, by thousands of tourists, or by a sturdy citizenry which wrests its living from these same deep valleys and steep mountain slopes. Not only is Switzerland the "playground of Europe"; it is one of the oldest republics in the world, with one of the most progressive and democratic of governments, and a national



LOCATION MAP

character laboriously welded from three separate groups. It is a perpetual safeguard to Europe's peace—a "buffer state" interposing itself between powers which touch it on the north, east, south, and west. Significantly, in its territory, which is internationally neutral, is the seat of the first united attempt to preserve peace, the League of Nations.

Though it encompasses some of the loftiest

peaks of Europe, Switzerland has an area of but 15,976 square miles, which is less than one-fourth the area of the New England states, or about half that of Maine. It has no seacoasts, being entirely surrounded by other countries. The Rhine and the Lake of Constance separate it from Germany, on the north; Austria and Liechtenstein lie on the east; Italy and Lake Geneva on the south; and France on the west.

People. In the racial characteristics of its people, Switzerland reveals two sharply contrasting strains—the Latin and the Teutonic—numbering together nearly four million. The Teutons form a preponderance of the population; the German language is spoken by the majority of inhabitants in nineteen of the twenty-five cantons, those of Central, Northern, and Eastern Switzerland. French and Italians constitute the Latin population. French people predominate, and their language is used in Geneva, Neuchâtel, Vaud, Fribourg, part of Valais, and the Bernese Jura; Italian is the language of the canton of Tessin (Ticino). The historical dialect of Romansh is still spoken by a small group (in the canton of Grisons), but is slowly declining.

Naturally, this old amalgamation of races, as well as the great variations in the nature of the surface of the land itself, would not tend to make a wholly united people with similar national characteristics. Switzerland has nominally twenty-two states, or cantons, about 3,000 communes, and 192 districts, which consist of groups of communes, each with its own local life and customs and independent claims.

In spite of this diversity, however, there is a distinct Swiss character. In it are the en-

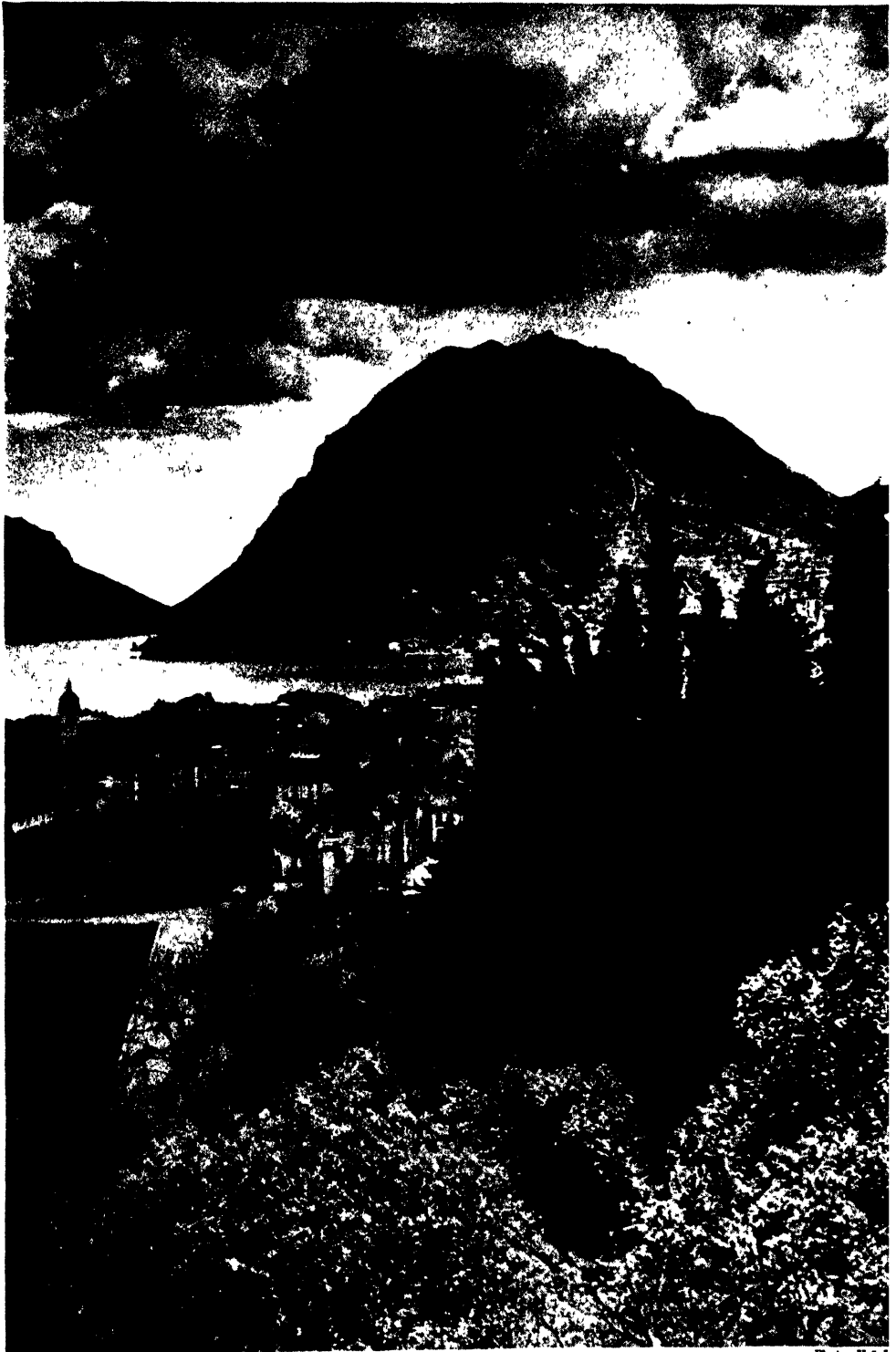


Photo: U & L

Lovely Lugano. A striking camera study of the town and lake, one of the most beautiful spots in Europe
Mont Bré is in the background.

thusiasm for liberty which won the confederation's freedom from Austria, the practical good sense that enabled the people to work out their progressive government, and the thrift which has made a prosperous nation live in an area with many natural disadvantages. These qualities are inherent in the city-dwellers, in the people of the pastoral districts, and in the mountain farmers. These latter have continually a severe struggle to gain a livelihood. They have not only the nature of the ground and the long, cold winters to contend with, but are in constant danger from avalanches, which may wipe out whole communities within a few minutes. In many places, earthworks and ridges of stone have been built to divert the direction of the avalanche from the community, should it by chance descend upon them.

The mountains of Switzerland attract sportsmen and travelers from all over the world, and the profession of guide enlists many of the mountaineers, who offer their services for mountain-climbers. They are hardy and brave, have a thorough knowledge of their territory, and at the same time are extremely cautious. This occupation, like that of the peasants, is handed down from father to son; thus a climbing party may have among its guides "old Peter" and "young Peter," both experienced mountaineers.

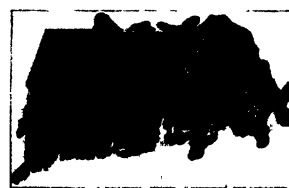
Religion. Switzerland has complete religious liberty of conscience and creed, but the introduction of new religious orders, the establishment of new bishoprics, and the activity of religious sects whose action interferes with other creeds or endangers the state, are all restricted by the confederation. The German-speaking cantons of the central and eastern parts of the country are Roman Catholic, while those of the north and west are Protestant. The cantons of Lucerne (Luzern), Valais, Fribourg, and Bernese Jura are Roman Catholic, but the other French-speaking cantons are chiefly Protestant. The farther south one travels, through the Roman Catholic cantons, the more frequently appear the great wooden crucifixes at turns in the road, or sheltered shrines to the Madonna, on lonely mountain pathways.

Education. Elementary education is obligatory in all of the cantons, but the law is most rigidly enforced in the Protestant communities. There are many trade and technical schools, and institutions for the deaf, dumb, blind, and mentally defective. The percentage of illiteracy among men eligible for military service is very low, only one out of one thousand being unable to read. There are seven universities in the country, at Basel, Zurich, Bern, Geneva, Lausanne, Fribourg, and Neuchâtel. The Federal government maintains a polytechnic school at Zurich.

The Cities. Far different from the placid and picturesque life of the rural folk is that of the Swiss cities, where modern industries mingle with, but do not destroy, the charm of history that

clings about many of them. Those of special interest are described below:

Basel, bah' zel, lies on the Rhine, on the northern border of the country, forty-three miles north of Bern. The city originated in a frontier post of the Romans, in the fourth century. It contains many fine old buildings, including an ancient cathedral,



A PUBLIC SCHOOL

In the canton of Bern, in a village of 3,600 people.

Photo: Visual Education Service

founded in 1010, containing the tomb of Erasmus, whose home was here; the oldest university of Switzerland, founded in 1459; a seminary for missionaries; and a museum containing a public library and fine pictures. The city also possesses a most

COMPARATIVE AREAS
Switzerland is about as large as Massachusetts, Connecticut, and two Rhode Islands.

valuable collection of the works of the Holbeins, who, for a time, made their home in Basel (see HOLBEIN).

Basel has been noted for over 200 years for the manufacture of silk ribbons; the manufacture of paper and aniline dyes, tanning, and brewing constitute the other industries. Basel is a great railway and distributing center, being the northern gateway of Switzerland, and since 1922 it has had one of the largest railway stations in Europe. In 1929 the city was selected as the location of the Bank for International Settlements (see INTERNATIONAL SETTLEMENTS, BANK FOR). Population, about 141,650 (1927).



Photos: Keystone; Herbert

Picturesque Switzerland. In the illustration in the upper left a young man is seen blowing an Alpine horn. Right, climbers ascending the almost perpendicular side of a mountain. Below, a railway viaduct in a Swiss canton where there are many peaks more than 12,000 feet high.

Bern, *bəhrn*, or *Berne, burn*, since 1848 the capital of the republic, is beautifully situated nearly 1,800 feet above sea level, and is surrounded on three sides by the River Aar. It is called the finest city in Switzerland; its fountains, its arcade-covered walks, its fine bridges, and quaint old shops are a joy to the tourist. Among its imposing buildings are the great Gothic minster, built between 1421 and 1573; the Church of the Holy Spirit; the Federal Council buildings, or Parliament House, commanding a splendid view of the Alps; and the university. The city is noted for its woollens, linens, silk stuffs, stockings, watches, clocks, and toys. Population, about 109,000 (1927).

The name is taken from the German word *Bären*, meaning *bears*, and was adopted, according to legend, because many bears were killed on the day the city was founded. In consequence of this tradition, the bear is almost a sacred animal in Bern, and the municipality keeps a Bears' Den, on the right bank of the Aar, in which a number of fat brown bears are always on view. Bears in wood and stone are everywhere to be seen throughout the city, as architectural ornaments.

Geneva, *je ne' vah*, is delightfully situated in view of the Alps, at the western extremity of Lake Geneva, at the outlet of the River Rhone. Geneva is distinguished as a theological, literary, scientific, and political center. It was the birthplace of the writer Rousseau, the naturalists Charles Bonnet and the Pictets, the humorist Töpfer, the physicist De Saussure, and the sculptor Pradier. In 1536, when Geneva invited Calvin to make his home there, it became one of the greatest strongholds of Protestantism in Europe (see CALVIN, JOHN). In 1919 it was selected as the seat of the League of Nations (which see). In 1928 a site was selected for the permanent office and conference hall of the League. A new building for the International Labor Office adjoins the League buildings. Geneva is also the headquarters of the Red Cross Societies of the world.

The ancient ramparts have been removed and many improvements introduced. Geneva is one of the principal entrances for tourists into Switzerland. Among its old buildings are the Transition Cathedral of Saint Peter, dating from 1124; the magnificent theater, one of the largest in Europe; and museums of antiquities, fine arts, and natural history. The staple manufactures are watches, clocks, music boxes, jewelry, gold and silver ornaments, and scientific instruments; and, in recent years, motor cars. Population, about 126,700 (1927).

Interlaken, *in tur lah' ken*, whose name means *between the lakes*, is a village in the valley of the River Aar, between Lakes Thun and Brienz. It is one of the most popular resorts of the Alps, being visited annually by thousands of tourists. The highway between the lakes is a continuous line of hotels and boarding houses; a former Augustinian monastery, founded in 1130, and now occupied by government offices, forms the nucleus of the village. Population, about 4,000.

Lausanne, *lo zahn'*, situated about one-half mile from Lake Geneva, is built on and around five hills, two of which are connected by a lofty viaduct. The city thus commands a fine view of the lake and the mountains of Savoy and Valais. The beautiful Gothic cathedral, the finest ecclesiastical building in Switzerland, built in the thirteenth century, is an imposing landmark. Close to the cathedral is a castle, built early in the fifteenth century; also near by is the

Palais de Rumine, containing an important local university. In recent years, Lausanne has undergone modern improvements, and many of the older picturesque buildings have been destroyed, or altered beyond recognition. The city is visited by a great number of tourists, and is well provided with hotels.

The opening of the Simplon Tunnel, in 1906, added greatly to transportation facilities and made the city an important industrial center. It is an educational center, however, that Lausanne is most famous, the splendidly conducted institutions attracting many foreign students. The population of 76,200 (1927) is composed chiefly of Protestants; French is the language spoken. See LAUSANNE, TREATY OF.

Lucerne, *lu surn'*, a quaint town on the banks of Lake Lucerne, a favorite city for tourists. The town is divided into two parts by the River Reuss; the modern section, with broad streets and great hotels, is on the west, and the medieval town, of crooked, narrow streets and old-fashioned houses, is on the east. In the latter part are the Hofkirche, a church dating from 1506; the sixteenth-century town hall, with its collection of art and antiques; and the famous "Lion of Lucerne," a huge lion carved in solid rock, in memory of the Swiss Guards massacred in defense of the Tuileries, in Paris, August 10, 1792. The city is noted chiefly for its surrounding beauty. Population, about 45,700 (1927).

Neuchâtel, *nuh shah tel'*, lies on the banks of Lake Neuchâtel, twenty-five miles west of Bern. Built on a slope rising from the shores of the lake, the place has a charming situation. Among its interesting features are an abbey church, dating from the twelfth century, and the old castle of the Counts of Neuchâtel, now used as a government building. Many fine public buildings, a university, museums of art and natural history, and a well-equipped public library bear witness to the progressiveness of the town. Neuchâtel is a railroad center of considerable importance; the chief industries are watchmaking and the manufacture of jewelry and electrical apparatus. Population, about 22,050 (1927).

Saint Moritz, *mo' rits*, a famous resort and watering place, lies in the upper part of the great valley known as the Engadine, over 6,000 feet above sea level, and is the highest village in the valley. The views from this elevated site are superb, and attract thousands of visitors at all seasons. In the summer come health-seekers from many parts of Europe and America, to benefit from the city's famous baths, celebrated since the sixteenth century, when the noted physician Paracelsus first called attention to them. In the winter the remarkable facilities for skating and tobogganing which the region affords attract tourists from all over the world, constantly swelling the permanent population of less than 3,000.

Zurich, *zu' rik*, situated at the northern end of Lake Zurich, is the largest city of the republic. The old city, with its steep, narrow streets and old-fashioned houses, has a quaintly medieval aspect, but the newer sections are modern in every respect. The Limmat, which flows through the middle of the city and divides it into two parts—the Little City and the Great City—is crossed by eleven bridges. Among the noteworthy edifices are the National Museum, with many relics commemorating the history of the republic; the Municipal Library; the Romanesque cathedral, dating from the eleventh century, of which Zwingli, the famous Swiss reformer, was pastor; and Saint Peter's Church. Zurich is a noted educational center. The cantonal university, founded in 1832,



THE LION OF LUCERNE

The inscription, freely translated, reads: *To the Fidelity and Courage of the Helvetians.* The statue was carved in solid rock in memory of the Swiss Guards massacred in defense of the Tuileries, in Paris, on August 10, 1792.

is the most celebrated institution for higher learning in Switzerland, and is especially famous for its medical school. The Federal Polytechnicum, or engineering school, founded in 1855, is also located here. The city has many other excellent schools, and an

interesting botanical garden, one of the finest in the world. Silk-weaving is the most important industry; cotton goods and machinery are also manufactured in the city. Population, over 215,000 (1927).

Physical Features, Resources, and Industry

General Features. The snow-clad Alps and the Jura range cover about three-fourths of the whole land, making Switzerland the most mountainous country on the continent of Europe. The loftiest masses of the Alps constitute the southern and central sections of Switzerland, and the Jura Mountains form a great curve in the northwestern part. Between these two mountain masses is an elevated plain, opening to the north, where the majority of the people find habitation.

In the Swiss Juras, there are no very lofty elevations, the highest summit, the Dôle, being a little over a mile above the sea, but the glacier-robed Alpine ranges send up many towering peaks, culminating in Monte Rosa, 15,217 feet in height, and the mighty Matterhorn, that mountain of solid rock. The Saint Gotthard group of mountains is the center of the great Alpine ranges, whose splendid scenery has attracted visitors from all over the world.

Waters. Four of the important rivers of Europe make their way through Switzerland, draining into four different seas. The Rhine, made up of the Vorder-Rhein and Hinter-Rhein, which take their rise in the Alps, flows

through Lake Constance; after emerging from the lake, it forms the northern border of Switzerland, whence it wends its way into the North Sea. The Rhone rises in the great Rhone Glacier, receives various mountain streams, widens into Lake Geneva, and flows finally into the Mediterranean. The Ticino finds its way through the Po into the Adriatic, an arm of the Mediterranean. The River Inn drains into the Danube, and thence into the Black Sea.

The melting of the snow in the mountains gives rise to many torrents, which rush foaming white down to the valleys. Switzerland is noted, too, for its waterfalls. The highest of these is Staubbach, in the Lauterbrunnen Valley, a lovely veil-like cascade which falls over 900 feet. The Handeck, near the source of the Aar, falls 225 feet, and the Pissevache, in the Rhone valley, 200 feet. The Reichenbach descends in seven falls, and the Giessbach in thirteen. The falls of the Rhine at Schaffhausen are only eighty-two feet in height, but an enormous mass of water descends.

Famous Lakes. The surface of Switzerland glimmers with myriads of lakes and Alpine

tarns. Of the larger lakes, those most famous for the grandeur of their scenery are the following:

Constance (in German KONSTANZ) is a beautiful lake of glacial origin, lying between Switzerland, Austria, and Germany. It is situated about 1,300 feet above the sea, at the north base of the Alps, and through it filters the River Rhine. It is about forty miles long and nine miles wide, and is divided into two branches at its northwest extremity. The north branch is called Ueberlinger See; the south, Untersee, or Zeller See. The surrounding country is given over to agriculture, with orchards and gardens, and is dotted with interesting ruins of ancient castles and prehistoric lake dwellings (which see). A characteristic of Lake Constance which cannot be explained, except on the unsatisfactory theory of rapidly melting snows, is its occasional sudden rise and fall. In 1770 it rose, in one hour, about twenty-four feet above ordinary level.

Geneva (in French LAC LÉMAN, in German GENÈVE SEE), the largest lake in Central Europe, is partly in Switzerland and partly in France. It reaches a depth of 1,015 feet, and its total area is 224 square miles, of which only eighty-three square miles belong to France. The River Rhone enters the lake at the east, and emerges at Geneva at the west. The lake is noted for the unusual clearness and blueness of its waters, and is surrounded by a mountainous region of great beauty. On its shores are many famous resorts, including Geneva, Lausanne, Ouchy, Vevey, and Montreux. Many thousands of visitors annually flock to these resorts. Near the eastern end stands the Château de Chillon, prison of Bonnivard, immortalized in poetry by Lord Byron in *The Prisoner of Chillon*. See illustration, in article CHILLON.

Lucerne, in North-Central Switzerland, is one of the most famous lakes in all Europe. It is roughly in the shape of a cross, with irregular, winding arms between steep, rocky cliffs, which, in some places, have pushed so far out into the water that they have made of Lucerne five divisions. Each of these divisions is shut off from the others, as far as the view is concerned, and each has its own particular beauty and hue, and abounds in picturesque scenery. The lake is about twenty-four miles long and two miles wide, with an area of about forty-five square miles. Around Lake Lucerne lived the men who laid the foundations of Swiss freedom, and associated with its shores is the mythical tale of William Tell.

Lugano, *loo gah' no*, known to the Italians as *Lago Ceresio*, lies at the foot of the Alps, its surface being 890 feet above sea level. It is situated partly in Lombardy, Italy, and partly in the Swiss canton of Ticino. The name is derived from the town of Lugano, the only important place on its banks. The winding length of Lake Lugano measures twenty miles, and is marked by rugged scenery of rare beauty. Picturesque villas dot the lower slopes of the surrounding hills, which abound in vineyards, olive and orange groves, and forests of chestnut and walnut. From Monte Salvatore, about 3,000 feet in height, a beautiful view of the picturesque town and lake is obtained.

Neuchâtel, the third largest lake of Switzerland, and the largest lying wholly within the country, is of historic interest as the former location of a group of lake dwellers (see LAKE DWELLINGS). The lake is twenty-four miles long, and has an area of about ninety-two square miles. On its shores are a number

of towns and villages, and several rivers flow into it. The lake is practically an expansion of the River Thièle, which enters it at the southwestern end and flows out again at the northeastern. Neuchâtel is the most important town on its banks. There are attractive forests and vine-clad slopes along the lake; in other portions, the shore is low and swampy.

Zurich is a beautiful lake lying in a deep valley in the midst of the most charming scenery of Northern Switzerland, making it a favorite resort of tourists. The lake is crescent-shaped, and measures about twenty-five miles in length and from about one-half to two and one-half miles in width. It is spanned by a beautiful bridge, which serves as a delightful promenade. Palatial hotels afford accommodations for the thousands of tourists.

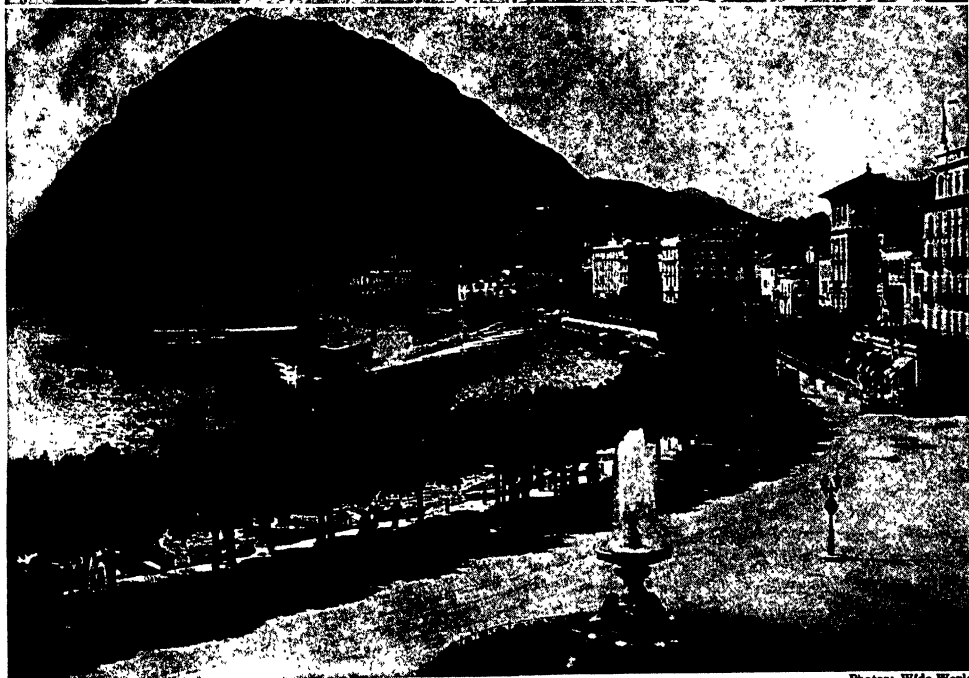
Climate, Plant, and Animal Life. The variations in altitude in Switzerland cause corresponding variations in climate and in the character of the vegetable life. In the valleys and on the lower mountain slopes, olives, beeches, oaks, pines, and firs grow. Higher up are the mountain pastures and rhododendrons, and above them come the eternal snows. On the central plain, there is an average annual rainfall of thirty-three inches, but in the higher regions the precipitation is much greater. The most remarkable prevailing wind is a hot, dry southwest or south wind called the *fohn*, which occurs most frequently in spring. The number of health resorts in Switzerland is evidence of its generally healthful climate.

Game is no longer abundant in Switzerland, though the chamois and ibex are still found high up the mountains. The chief game birds are grouse, partridge, and snipe.

The discovery that tuberculosis could be cured in dry, cold, clear air, as well as in a southern climate, is one of the factors in the development of Switzerland as a health resort. Sanitariums have been built at several points, and the hot springs and salt and mineral baths in Bern, Baden, and Schaffhausen attract numerous travelers. Magnificent scenery, a healthful climate, and unrivaled facilities for sports lure thousands of tourists, annually, to Switzerland, affording the republic one of its chief sources of income. This tourist travel, which declined during the World War, reached its pre-war level in 1925, and has since exceeded that record.

Agriculture. In spite of its mountains, glaciers, lakes, and rivers, over three-fourths of the area of Switzerland is productive. In addition to the forests, there are meadows and mountain pastures which support immense numbers of cattle and goats, reared for their milk, skins, and flesh. The dairying industry is important, and condensed milk and cheese are exported in great quantities. The lakes are important fishing grounds.

In the valley of the Vorder-Rhein, grain is cultivated at the highest known elevation in Europe. This is near the village of Tschamut,



Photos: Wide World

Winter and Summer in the Playground of Europe. Above, at Davos is the largest skating rink on the continent; it covers more than seven acres. Below, another view of the waterfront at Lugano.



Photo: O R O C

THE CAPITOL BUILDING AT BERN

5,400 feet above the level of the sea. The grain is rye, and the growing season is so short that the peasants have erected a rude but ingenious drying apparatus in the fields, so that they will not have to depend upon the inconstant sun to dry their harvests. But there are many communities which do not depend even upon rye, but gain their entire subsistence from the alps, or mountain pastures, where they feed their cattle during the short summer months. In the highest of these mountain communities, snow commonly falls in June, and the cultivation of corn is impossible. Even a few patches of potatoes are ripened only with difficulty.

In the lower valleys, rye, oats, and potatoes grow more successfully, and nuts, olives, and grapes are produced in favorable places along the lakes and on the southern slopes of the mountains; nevertheless, the great proportion of the food supplies of the country must be imported.

Though hampered by scarcity of coal and iron, the Swiss have made remarkable progress in manufacturing. Their cotton fabrics are

known the world over for their excellent quality, and their machine-made laces and embroideries are likewise famous. Silk ribbons made by the Swiss are among the best to be had, and Swiss watches, jewelry, and music boxes find their way into the markets of all the world. Wood carving, straw plaiting, and the manufacture of leather goods, woolen goods, confectionery, and machinery, are also important. The chief manufacturing cantons are Zurich, Glarus, Saint Gall, Appenzell, Neuchâtel, Basel, and Geneva.

Transportation. Switzerland has three main trade routes—the Rhine Valley, leading to Belgian and Dutch ports on the north; the Rhone Valley, opening to France on the west; and a railroad line southward through the Saint Gotthard Tunnel. The Simplon, the longest railroad tunnel in the world, pierces the Alps between Switzerland and Italy. There are about 1,800 miles of railroad in the republic, owned and operated by the national government, and gradually being electrified. There is also a network of carriage roads, and these are kept in admirable condition.

Government and History

Government. Switzerland is a confederation of twenty-two cantons, three of which, Basel, Appenzell, and Unterwalden, are politically divided into two half-cantons each. Four are called Forest Cantons, namely, Schwyz, Uri, Unterwalden, and Lucerne. They are grouped about Lake Lucerne. As Schwyz was the most prominent in the war for freedom, and members of the confederacy for independence were known to the outside world as Switzers, this canton ultimately gave its name to the entire league. Each canton has its own constitution

and local government, and is divided for administrative purposes into districts. The districts are, in turn, divided into communes. In nearly all of the cantons, the principle of the initiative and the referendum is successfully applied. The Swiss cantons are republics in miniature, having extensive powers in local affairs.

The executive power is vested in a Federal Council of seven members, elected for a term of three years by the Federal Legislature, or Federal Assembly, each Council member repre-



Photo: U & U

AS PERFECT AS GENIUS COULD SET A THEATRICAL STAGE

A beautiful view in a Swiss village street. The young women are wearing their Sunday and holiday costumes. Thousands of tourists every year are entranced by such scenes as this.

senting one of the seven departments of administration. No decision is effective unless made by a majority of the members. The president of the Council, elected by the Federal Assembly for a term of one year, is also President of the Swiss Confederation during that time.

The Legislature is composed of two houses, the National Council and the Council of States, the Swiss names for these bodies being *Nationalrat* and *Ständerat*. The Council of States is composed of two members from each canton, whose terms vary from one to four years. Each canton regulates the tenure of office, salary, and qualifications of its own representatives. The National Council is made up of members chosen for three-year terms by direct universal suffrage, the membership being apportioned on the basis of one Deputy to every 20,000 persons.

Popular control of legislation has reached its highest perfection in Switzerland, by virtue of the initiative and referendum. The initiative grants the people the right of petitioning the Legislature to make a law or to adopt an amendment to the Constitution; the referendum gives them the right to ask that a law passed by the Federal Legislature be submitted to the popular vote. The latter right has been a part of the Swiss law since 1874.

Defense. Switzerland's natural defenses of mountains are supplemented by fortifications

defending the Saint Gotthard Pass on the south, and the Rhone Valley on the north. Its defense in man power is in the national militia, service in which is compulsory. Men from the ages of twenty to forty-eight are liable for



Photo: Visual Education Service

HARVEST ON THE MOUNTAINSIDE

Dragging home the crop of hay from high Alpine fields in the Engadine.

service. Switzerland, if it were invaded, could muster a defending force of more than 200,000 men.

History. The country in Roman times was the home of the Helvetians and the Rhaetians, who at different times were conquered by Roman armies. During the German invasions,

Switzerland was occupied by the Alemanni and the Burgundians, and eventually the whole country became a part of the empire of the Franks. In the eleventh century, it came under the rule of the German emperors, and so became a part of the Holy Roman Empire. Late in the thirteenth century, the House of Hapsburg, the imperial dynasty of Austria, became very powerful in the country. The tyranny of the Austrian rulers led to the formation, in 1291, of a league of three Forest Cantons—Uri, Schwyz, and Unterwalden. These cantons entered into a perpetual alliance to resist Austrian oppression, and this union was the first step in the war for Swiss independence.

The annals of this period abound in tales of heroism. Typical of the spirit of the time, though perhaps not

historically accurate, is the story of William Tell. In 1315 the first blow for liberty was struck when the confederation defeated the Austrians at the Battle of Morgarten. This victory gave the Swiss seventy years of peace.

Meantime Lucerne, Zurich (center of a powerful coalition), Glarus, Zug, and Bern joined the confederation, and the united cantons were able to present a strong front against the Austrians when war was renewed in 1386. At Sempach (1386), where Arnold Winkelried "made way for liberty and died," and at Näfels (1388), the Swiss were completely victorious, and Austrian power was permanently weakened.

In 1415 the cantons began offensive warfare, compelling Austria to relinquish Aargau, and about half a century later, they added Thurgau to their country. Then followed a war with Charles the Bold of Burgundy, in which the Swiss were again victorious. In 1481 the confederation was strengthened by the addition of the towns of Fribourg and Solothurn. Eighteen years later (1499), the Emperor Maximilian I began a war to place the Swiss again under the rule of the empire, but the cantons held their ground in six desperate battles. Though they were practically independent from this time on, their independence was not formally recognized until 1648, when the Peace of Westphalia was ratified. In 1501 Basel and Schaffhausen came into the confederation, and in 1513 Appenzell was admitted.

The Protestant Reformation, which began in Germany in this period, soon made itself felt in Switzerland, and the cantons were involved in religious wars in the sixteenth century. Through the influence of Zwingli and of Calvin, the latter of whom made Geneva his headquarters, Protestant doctrines spread rapidly through the country; difficulties between opposing factions were partially adjusted by the

Peace of Westphalia, which closed the Thirty Years' War.

Dissension between religious factions and a growing political aristocracy, with oppressive power in the hands of a few, marked the next century and a half in the loosely knit Swiss Confederation. The French Revolution affected many of the cantons, causing minor revolts against the aristocrats; when the

French occupied the country, in 1798, the short-lived Helvetic Republic was founded, to take the place of the old confederation. In 1803 Napoleon organized a new confederation with nineteen cantons, and imposed a new Constitution on Switzerland. This alleviated, to some extent, the wrongs of the French occupation, but the waning of Napoleon's power endangered the small buffer state.

When the affairs of troubled Europe were settled, in 1814-1815, by the Congress of Vienna, the powers acknowledged the independence of Switzerland and guaranteed its perpetual neutrality. A confederation of twenty-two cantons was organized (three being divided into half-cantons). The Constitution of 1815 had placed emphasis on the rights of cantons rather than on a union, and years of strife between Catholics and Protestants and between aristocratic and democratic factions followed. After the Revolution of 1848, the old federation of states gave way to a federative state, with strengthened central powers and efficient government. A further revision of the Constitution in 1874 gave more extensive powers to the central government. Various progressive laws were later enacted, including legislation for old-age pensions and workmen's insurance.

Since that date, Switzerland has made rapid progress. During the World War, the country maintained its neutrality successfully, though

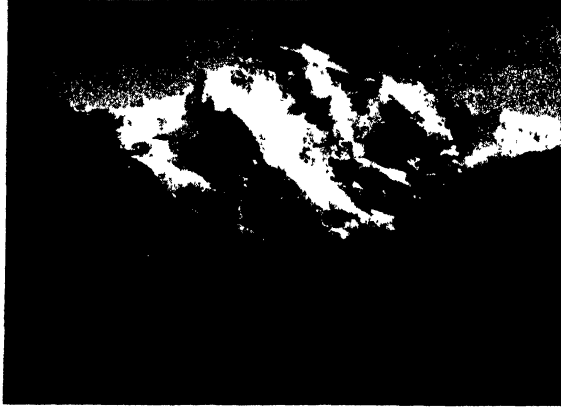


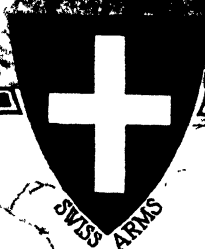
Photo: Visual Education Service

THE MAJESTIC JUNGFRAU

Bathed in sunshine after the shadows of approaching night fill the lower valleys.

SWITZERLAND

Mountain
climbing



The Swiss Peasants Live in Surroundings Such as These

OUTLINE AND QUESTIONS ON SWITZERLAND

Outline

I. Location

- (1) Latitude, 45° 49' 2" to 47° 48' 32" north
- (2) Longitude, 5° 57' 26" to 10° 29' 40" east
- (3) Relation to other countries
- (4) Absence of seacoast

II. Size

- (1) Actual area, 15,976 square miles
- (2) Area compared with that of states and other countries

III. The People and Cities

- (1) Population
- (2) Radical strains
- (3) Dominant characteristics
- (4) Struggle for livelihood
- (5) Religion
- (6) Education
- (7) Cities

IV. Physical Features, Resources, and Industry

- (1) General features
- (2) Famous lakes
- (3) Climate
- (4) Plant and animal life
- (5) Agriculture
- (6) Manufacture
- (7) Transportation

V. Government

- (1) Confederation
- (2) Defense
 - (a) Universal liability to military service

VI. History

- (1) The early days
- (2) Under the Holy Roman Empire
- (3) Under the House of Hapsburg
- (4) The struggle for independence
- (5) The Reformation
- (6) The period of internal troubles
- (7) Establishment of a stable government
- (8) Switzerland and the World War

Questions

How many languages are spoken in this little country?

What is the drop of the highest of Swiss waterfalls? How does this compare with the drop of Niagara?

What famous poem celebrates a castle in Switzerland? Where is this castle located?

Why would you not be likely to have as your guide in mountain-climbing the son of a Swiss peasant farmer?

Where is the highest elevation on the continent where grain is raised? To what measures do the farmers have to resort to dry their crops? Why?

Who "made way for liberty, and died," and how did he do it?

What is the tallest mountain entirely within Switzerland?

What difficulties do the mountain peasants meet? What constant danger do they face?

What special part did the three Forest Cantons play in the history of the country?

In what sense may Switzerland be called the "playground of Europe"?

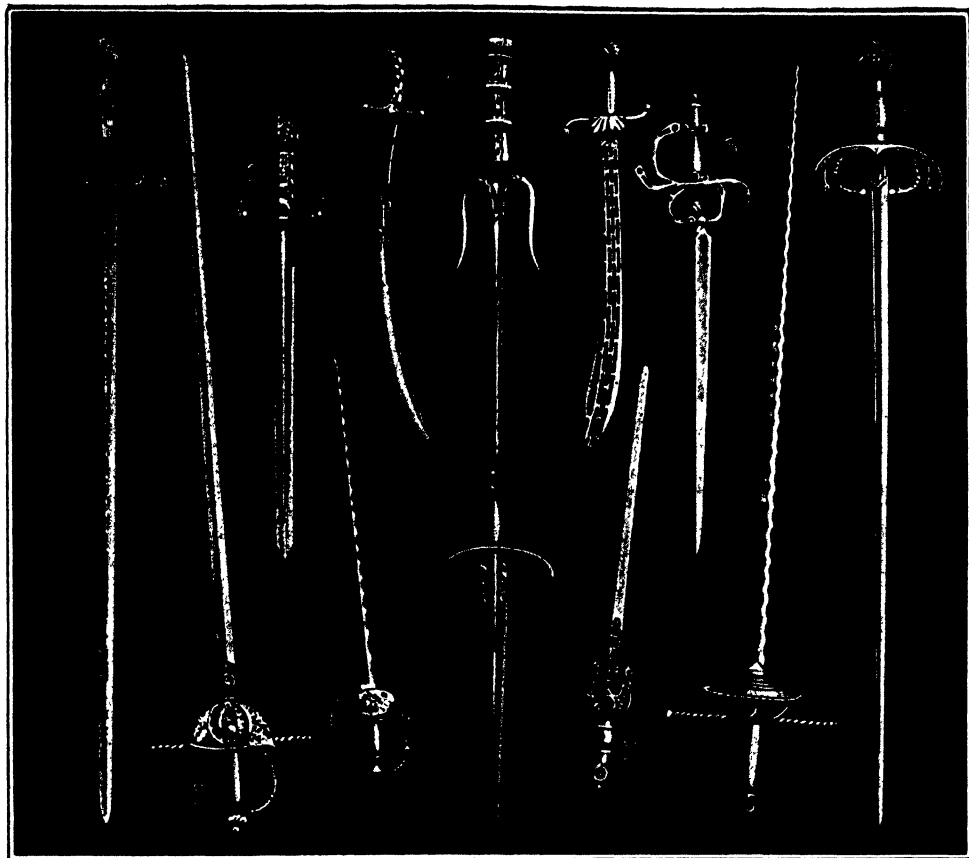
What other claims to distinction has Switzerland?

often under great difficulties. The Swiss legation took charge of German interests in the United States when the United States severed diplomatic relations with the German government. After the war, the Swiss city of Geneva was chosen as the headquarters of the League of Nations, giving Switzerland added world-wide importance and distinction. M.P.

Related Subjects. The following articles in these volumes will give added details as to the geography and life of Switzerland:

Austria-Hungary
Calvin, John
Franks
Helvetii
Holy Roman Empire
League of Nations

Reformation
Tell, William
Thirty Years' War
Winkelried, Arnold
World War
Zwingli, Ulrich



SOME FAMOUS SWORDS

- (1) Sword of Isabella of Spain. (2) Francis I of France (3) Persian sword of the sixteenth century. (4) Moorish boarding sword (5) Cutlass of the sixteenth century. (6) Sword of the sixteenth century. (7) Sword of a medieval naval chief. (8) Sword of the early modern period in Scandinavia (9) Flaming sword of Don Juan of Austria (10) Sword of the fifteenth century. (11) Sword of a cardinal in the court of Philip IV of Spain. (12) Flaming sword of Philip IV.

MOUNTAINS	
Alps	Mont Blanc
Jungfrau	Monte Rosa
Matterhorn	Saint Gotthard
RIVERS	
Rhine	Rhone
UNCLASSIFIED	
Avalanche	Mer de Glace
Chillon	Saint Bernard, Great
Glacier	Simplon

SWITZERLAND OF AMERICA, a term applied to British Columbia (which see).

SWORD, *sohrd*, one of the most ancient of all weapons of offense and defense, whose origin is lost in remote antiquity. As soon as the art of working metals was discovered, the ingenuity of man was turned toward the manufacture of destructive weapons. The earliest forms of swords of which authentic information is available were those of the Assyrians, Gauls, and Greeks. The swords used by these people

were made of bronze, and were short, two-edged weapons. The Roman sword, a terrible weapon in the hands of trained legionaries, was of steel, short and straight, with a sharpened point and two cutting edges.

With the invention of gunpowder, weapons designed for close combat nearly passed into oblivion, but the light rapier remained the recognized dueling weapon. High art was exercised in the tempering of rapier blades, Toledo, Spain, becoming famous for the fine quality of its product. The favorite weapon of the East was the scimitar, a blade with a pronounced curve. Damascus was noted for its scimitar blades.

The Sword in Modern War. The cavalry of modern armies bear swords of from two and one-half to three feet in length and about two and one-half pounds in weight, but as the value of cavalry in combat declines, such ap-

purtenances become of less value. In the United States army, the sword proper has given place to the saber, which is designed for both cutting and thrusting.

In the World War, experience proved that there was little opportunity for use of the sword. There was practically no cavalry action, and the best weapon for the intrepid charge was the bayonet, which all soldiers were taught to use with deadly precision.

Figurative Use of the Word. The sword has been from Bible times a favorite figure of speech to denote strife and conflict. "He that liveth by the sword shall perish by the sword" has a lesson for civil life, as truly as for the military. The Hebrew prophets sought to have the swords of the nation turned into plowshares, while the New Testament speaks of "the sword of the Spirit."

prey upon squid and upon menhaden, herring, mackerel, and other kinds of fish that travel in schools.

L.H.

Scientific Name. The swordfish is known as *Xiphias gladius*.

SWORD OF DAMOCLES, dam' o kleez. See DAMOCLES.

SYCAMORE, sik' a mohr, an attractive shade tree of the plane-tree family, whose hard, reddish-brown wood is used in making furniture and various kinds of woodwork. It is found abundantly in fertile bottom lands and



Photo: U & I

A FLORIDA YOUNGSTER "PLAYING HORSE"

A huge 850-pound swordfish, killed after a battle with a school of porpoises which lasted twenty minutes. The swordfish is seldom seen as far north as Florida.

SWORDFISH, a species of ocean fish having a long, flattened upper jaw that resembles the weapon from which it derives its name. The swordfish is allied to the mackerels. Though found most commonly in the Atlantic Ocean, it occurs also in the Pacific, and occasionally is seen in the neighborhood of the Santa Barbara Islands, Southern California. The average length of a swordfish is seven feet, and the weight is about 250 pounds, but specimens weighing 600 or 800 pounds are recorded.

Their "swords," sharp-edged and strong, and half as long as the body, are powerful weapons, capable of driving into the side of any sailboat or rowboat. Fishermen capture these fish by harpooning them from a pulpit on the bow of a sailboat, while the fish basks near the surface. The flesh is coarse, but when cut and cooked as a steak, it has a good flavor. Swordfish

along streams, and is distributed from Southern Maine to the north shore of Lake Ontario, west to Minnesota and Nebraska, and as far south as Texas and Florida. This tree grows from 75 to 120 feet high. On the lower trunk its bark is a dark reddish-brown, and on the limbs an olive-green. The bark on the branches breaks off in small scales, exposing an inner bark of light color, and giving an effect expressed in the familiar phrase—"hoary-antlered sycamore."

The broad leaves, which furnish delightful shade, are yellow-green with a pale lining, and have irregularly cut margins and prominent veins. There are two kinds of flowers, those bearing stamens and those bearing pistils. The former are a deep red, and the latter a pale green with a tinge of red. They open in May, when the leaves unfold. The fruit of the sycamore.



SYCAMORE TREE, LEAVES, AND BALLS

Photo: Visual Education Service; St. Clair

more is a dry seed ball, which hangs from a flexible stem. Other names for this tree are *buttonwood* and *American plane tree*. G.M.S.

Scientific Name. The botanical name of the plane-tree family is *Platanaceae*. The tree described above is *Platanus occidentalis*.

SYDENHAM, *sid' en am*, CHARLES EDWARD POULETT-THOMSON, first Baron (1799-1841), a British statesman and colonial administrator, Governor-General of Canada from 1839 to 1841. After a distinguished career in England, he was sent to Canada to bring about the legislative union of Upper and Lower Canada (later Ontario and Quebec), a duty which he fulfilled with very general satisfaction. As a reward, in 1840 he was created Baron Sydenham of Kent and Toronto, but lived only a year to enjoy this new honor.

Sydenham, or POULETT-THOMSON, as he was better known, was born at Wimbledon, Surrey, England. In 1826 he was elected to the House of Commons, in 1830 he entered Earl Grey's Ministry as Vice-President of the Board of Trade, and in 1834 became its President. During these years, he was conspicuous as a reformer along economic lines; tariff laws tending toward free trade, banking and factory legislation, the abolition of usury laws, and commercial treaties with foreign countries, were some of the many subjects which showed the marks of his work. His sudden death, from an accident, came before he had developed his powers

to the full, but not before he had made a place for himself in history.

SYDNEY, capital and metropolis of New South Wales (which see).

SYDNEY, N. S., the second largest incorporated city of the province, ranking next to Halifax. It is situated on the northeast coast of Cape Breton Island, and is the terminus of the Sydney & Louisburg Railway and of the eastern division of the Intercolonial Railway (Canadian National). There is regular steamship connection with all important Canadian Atlantic ports. North Sydney and Sydney Mines are on the opposite side of the harbor. Sydney is 276 miles from Halifax. Population, 26,000 (estimate).

The city is noted for its coal trade and for its extensive production of iron and steel. It is the commercial center, both for wholesale and for retail trade, of the great coal field in Canada. The plant of the Dominion Iron & Steel Company, which cost \$40,000,000 and employs 4,000 men, is the greatest of its many industrial establishments.

SYDPROVEN, largest of the settlements of Greenland (which see).

SYENITE, *si' e nite*. See GRANITE.

SYLLOGISM, *sil' o jiz'm*. See LOGIC.

SYLVAN LAKE. See SOUTH DAKOTA (Rivers and Lakes).

SYLVIVUS, *AENEAS*. See PIUS (II, Popes).

SYMBOL, *sim' bol*, a sign by which one knows or recognizes an object or an idea. In

one sense, all words are symbols. Spoken words are the symbols for objects and ideas. The letters of the alphabet are symbols for particular sounds, and these symbols are combined to form the written words which are the symbols for spoken words.

One of the most conspicuous and familiar symbols in all nations is the national flag. To every person, the flag of his nation means "my country." Colors have a recognized and almost universal symbolism, and so have animals. Black is the symbol of grief among Americans and Europeans; white is the symbol of innocence (though in some countries it symbolizes mourning); blue stands for sincerity; and purple for royalty. A lion is the symbol of courage; a lamb suggests meekness; the dove and the olive branch typify peace.

Every religion has symbols, particularly pictured ones. In all ages since the Crucifixion of Christ, the Cross has been the recognized symbol of Christianity throughout the civilized world (see CROSS). The ship was an early Christian symbol which represented the Church, in which "the faithful are carried over the sea of life." The Gospel writers are represented by symbols: the winged man is Saint Matthew; the winged lion is Saint Mark; the winged ox is Saint Luke; and the eagle is Saint John. Other saints carry symbolic emblems by which they may be recognized—Saint Mary Magdalene by a box or vase (for ointment); Saint Paul by a sword; Saint Andrew by a cross.

In mythology there are innumerable symbols, such as the trident, which is the symbol of Neptune; the peacock, of Juno; and the mirror or apple, of Venus. Neptune's trident is used in astronomy to designate the planet which bears his name. Another pictured symbol is the skull and crossbones, which, according to the law, must be placed on all bottles and boxes containing poison. This symbol was once the emblem on the flag flying from the mast of pirate ships, white on a black ground; then, as now, it symbolized death.

The sciences—mathematics, chemistry, astronomy, botany, and biology—have special sets of symbols for representing the different objects, elements, and operations involved, which are used in place of words. Some of the symbols in astronomy are so ancient that their origin is unknown. The symbols for the principal heavenly bodies are:

Sun ☉	Jupiter ♃	Pallas ♀
Venus ♀	Uranus ♅	Vesta ♁
Moon ☾	Mercury ☿	Saturn ♄
Ceres ♁	Earth ♂ and ♀	Neptune ♆
Juno ♀	Mars ♂	

A star is represented thus: *.

The phases of the moon are indicated in this manner: ● new moon; ☾ moon in first quarter; ☉ full moon; ☾ moon in last quarter [see MOON (Phases of the Moon)].

Mathematical symbols are numerous, and most of them are very familiar. First, there are the symbols of value, the Arabic and Roman numerals, and the letters of the alphabet; then there are the symbols of operations, such as +, the sign of addition; −, of subtraction; ×, of multiplication; ÷, of division. The character π (pi) stands for the number 3.1416, which is used in computing the area, circumference, and diameter of circles; *c* stands for circumference, *d* for diameter, *v* for volume, *a* for area.

In chemistry, the first or the first with another letter of its English, Latin, or German name is used to designate a metal or an element. *Hg* (from the Latin) is the symbol for mercury; *Fe* (also from the Latin) is the symbol for iron. *H* stands for hydrogen, and *O* for oxygen. Such a symbol not only represents an element, but it also stands for a specific quantity of that element. *O* always means sixteen parts, by weight, of oxygen; *Fe* always means 56 parts, by weight, of iron. So a chemical formula may be constructed simply by putting down the letters of the elements composing the compound. Small numerals may be added to each letter to show exactly what proportion is needed. Thus, the formula for water is H_2O ; $AgCl$ represents the composition of silver chloride, $Al_2(SO_4)_3$ that of aluminum sulphate [see the article CHEMISTRY (The Elements)].

SYMPATHETIC INK. See COBALT.

SYMPATHETIC NERVOUS SYSTEM. See NERVOUS SYSTEM.

SYMPHONY, *sim' fo nie*, a musical composition written for the orchestra. It consists usually of four movements, in form being the same as the sonata (which see). Haydn was the first great master to use the modern symphony form, but it was through the genius of Mozart and Beethoven that the symphony attained its present high rank, that of the loftiest form of instrumental composition. See ORCHESTRA; MUSIC.

SYMPHONY ORCHESTRA. See ORCHESTRA, subhead.

SYNAGOGUE, *sin' a gog*, a place of local worship among the Jews. Supposed to have originated at the time of the Babylonian Captivity (sixth century B.C.), it was in existence, wherever the Jews had settled, at the time of Jesus, and continues among them to the present day.

In New Testament times, the synagogue was built at the cost of the community. It was so constructed that the worshiper, on entering or at prayer, faced in the direction of Jerusalem. The furniture included a chest, known as the Holy Ark, in which were kept the rolls of Scripture used in the service; a lamp that burned perpetually, symbolizing the presence of Jehovah; candlesticks for use on Sabbath and feast days; a rostrum for the reader, and prob-

ably a desk on which to rest the roll; seats for the elders, in front of the Ark and facing the people; and seats for the congregation, the men on one side and the women on the other, divided by a screen. The ruler of the synagogue was responsible for the service, and he chose those who should take part. The elders formed the lesser Sanhedrin, a body having civil and religious authority over local cases. They were examined by members of the great Sanhedrin, but were elected by the congregation.

The Great Synagogue, a body of 120 members, was probably organized at the time of Ezra and Nehemiah, to define and teach the Law. It is believed to have finally determined the Old Testament canon. At a later period, it became merged with the Sanhedrin (which see).

SYNAPSE, *sih nap' se*. See NERVOUS SYSTEM (Structure of Nervous Tissue).

SYNCOPATION, *sin ko pa' shun*. See MUSIC (A Course of Lessons: What Is Rag-time?).

SYNCOPE, *sin' ko pe*. See FAINTING.

SYNDICALISM, *sin' dih kal iz'm*, a condition sought in the labor world, by which the day laborer shall control all industry. Just the means to be employed are difficult to state, for among men who preach syndicalism and who aim to bring it to reality, there is no unanimity of opinion. Syndicalists are not looking for success through the Socialists; they do not hope for results through politics, although many of them belong to the Socialist organization. They do not wish for ownership of industry by the state, unless they are strong enough to control its policies, and of this they have no present hope. They have learned to expect nothing from legislative action which will strengthen their cause. They do not even look for support in their revolutionary plans from trade-unionism collectively. Syndicalism must be worked out on lines peculiarly its own, for its supporters recognize the impossibility of winning the adherence of those who believe in the existing order. Those who aim to advance the great cause of labor by working along lines which are even moderately conservative, denounce syndicalism. Its foremost advocates in America are the Industrial Workers of the World, an extremely radical organization made up very largely of migratory, or "casual," laborers.

The advocates of syndicalism have therefore adopted a policy not countenanced by legal standards. By harassing their employers, the capitalists, whom they look upon as their enemies, they hope to wear them down and force them through never-ending losses to lose interest in industrial life. It is proposed to accomplish this by boycotts, strikes, and particularly by sabotage. When the capitalists are weakened and in despair, it is the purpose of the syndicalists to inaugurate a vast strike, and in one supreme effort to take possession of all industry.

It is the hope of the syndicalists that the railway workers shall control all railroads, that miners shall control all mines, that factory workers shall run the factories, and so on through the whole industrial range. They all agree in demanding all the benefits that accrue from labor.

E.J.

Related Subjects. The following articles may be consulted in this connection:

Boycott	Sabotage
Capital	Socialism
Labor Organizations	Strike

SYNECDOCHE, *sin ek' doh ke*, a figure of speech in which a part of a thing is used for the whole, or the whole for a part. It may be considered a form of metonymy. The expression "a fleet of forty sail" contains an example of synecdoche, *sail* being used for *ship*, or *ships*, or a part for a whole.

Related Subjects. For purposes of comparison, the following articles in these volumes may be consulted:

Figure of Speech	Metonymy
Metaphor	Simile

SYNGE, *sing*, JOHN MILLINGTON (1871-1909), an Irish dramatist, born at Rathfarnham, near Dublin. He was graduated from Trinity College, and later is said to have wandered over Europe, a silent, poverty-stricken man in ill health. During this period, he picked up numberless stories and legends among the common people. These were afterward depicted faithfully in his plays, which he began producing in 1903.

After the completion of *Aran Islands* and the production of several short poems, he began, in 1903, to write plays, the prevailing note of which was sadness, whether they were comedies or tragedies. His work has been produced with success both in Europe and in America; all the completed dramas deal with Irish peasant life, of which he gives fearless, melancholy, tragic, and humorous pictures. He was in Dublin, working on *Deirdre of the Sorrows*, at the time of his death.

Other Works. These include *The Playboy of the Western World*, *The Shadow of the Glen*, *The Tinker's Wedding*, *Riders to the Sea*, and *The Well of the Saints*.

SYNOD, *sin' ud*. See PRESBYTERIANS.

SYNODIC, *sih nod' ik*, **PERIOD**. See MOON (Orbit, Size, and Distance).

SYNOVIAL, *sih no' vih al*, **FLUID**. See JOINTS; SECRETION.

SYNTAX, *sin' tak*s, a division of grammar that treats of the orderly arrangement of words to form sentences, and the grammatical relations of words in the sentence. *Syntax* is derived from a Greek word meaning to *put together in order*, used to indicate the drawing up of an army in battle array. It is thus an appropriate term to describe the building up of sentences, which may be described as the marshaling of words to express thought.

The relation that any word bears to the other words in the sentence is known as its *syntax* or *construction*, and when an expression is used ungrammatically, we say that such use is an error in syntax. The use of a singular verb with a plural subject, for instance, as *They was here*, is an error in syntax. In the study of grammar, the student not only learns how to put words together to make sentences, but he learns how to take the sentences apart—to break them up into the elements of which they are composed. The first process is known as *synthesis*, and the second as *analysis*.

Related Subjects. The various phases of this subject are discussed in detail in the articles listed below. In the articles on the parts of speech, full directions are given for parsing, and the special errors in syntax connected with each part of speech are pointed out. See:

Adjective	Inflection
Adverb	Interjection
Analysis	Mode
Article	Noun
Case	Parsing
Comparison	Participle
Conjugation	Person
Conjunction	Preposition
Declension	Pronoun
Gender	Punctuation
Grammar (Sentence- Building)	Sentence
Infinitive	Tense
	Verb

SYNTHESIS, *sin' the sis*, means, literally, the putting together of two or more elements, as in logic. See **THOUGHT**; **SYNTAX**.

SYNTHETIC PLASTICS, *sin thel' ik plas'-tikks*. See **CELLULOID**; **BAKELITE**.

SYRACUSE, *seer' a kuse*, a small municipality of Sicily, occupying the site of one of the most powerful cities of the ancient Grecian world. Near the close of the eighth century B.C., a band of colonists from Corinth made a settlement on the small island of Ortygia, near the Sicilian shore. The colony developed into a rapidly growing city that soon spread over to the main island, which was connected with the islet by a causeway.

Ancient Syracuse had a long and eventful history. In the fourth century B.C., under the rule of Dionysius the Elder (which see), it became a center of Greek art and culture, and won renown because of a victorious war with Carthage. In 212 B.C., however, the city was captured by the Romans, whose fleet had been set on fire by the burning glasses of the famous mathematician Archimedes (which see). Thereafter the city gradually declined, being reduced finally to its ancient limits. Ortygia, the present site, is now a peninsula.

Modern Syracuse, the capital of a province of the same name, has a population of about 56,000 (1928). It is interesting chiefly because of its ruins—monuments of past glory. Some Doric columns of antiquity may be seen in a cathedral erected about the ruins of a temple. The fountain of Arethusa, famed in legend, is in the southern part of Syracuse. See **ARETHUSA**.

SYRACUSE, BATTLE OF. See **FIFTEEN DECISIVE BATTLES**.

SYRACUSE, N. Y., the fourth city in size in the state and the county seat of Onondaga County, is situated 148 miles west of Albany and 150 miles east of Buffalo. Its location in an extensive and rich agricultural section, and its excellent transportation facilities, have made the city an important manufacturing and distributing center. Population, 1928, 199,300 (Federal estimate).

Syracuse occupies an undulating site on Onondaga Creek, in one of the most beautiful scenic areas of the state, near the Finger Lakes region. The streets are wide, and many of the residential thoroughfares, such as James, West Onondaga, and East and West Genesee streets, and University Avenue, are framed by arches formed by ancient elms. The park system comprises over 400 acres, the largest of the parks being Onondaga, Burnet, Kirk, Schiller, Lincoln, and Thornden. Green Lake, at Jamesville, close to the city, is a state park. The commercial district is substantially built, and contains many modern and imposing buildings grouped around Saint Mary's Circle.

Transportation. The railroads serving the city are the New York Central, the West Shore, and a branch of the Delaware, Lackawanna & Western. Syracuse is located on the New York State Barge Canal, connections being made through Onondaga Lake and the Seneca River to the Hudson River and Lake Erie, and through the Oswego Canal to Lake Ontario and the Saint Lawrence River. A number of interurban and motorbus lines give additional passenger and freight service.

Commerce and Industry. The first industry of the city was the exploitation of the salt deposits, but the salt works have long since been abandoned. Salt, however, brought to the city another important industry, the use of this mineral in the manufacture of soda ash and bicarbonate of soda, together with many by-products. The industry is controlled by the Solway Process Company. The brine used by this company is brought through pipes from wells twenty miles south of the city. Syracuse is also a leading city in the manufacture of automobiles, tool steel, agricultural implements, chinaware, wax candles, mincemeat, powdered milk, typewriters, electrical hardware, steam clothes-pressing machines, shoes, boilers and radiators, and cash-carrying and conveying equipment. There is a large export trade.

Institutions. The city is the seat of Syracuse University (which see). Other educational institutions include Saint John's Academy (Roman Catholic), Travis Preparatory School, and Saint John's Military School (Episcopal). The Court of Appeals Law Library, housed in the courthouse, belongs to the state and has over 40,000 volumes.

History. The settlement of the city was begun in 1805, and it was known as South Salina, Bogardus' Corners, Cossitt's Corners, and Milan, until it was finally named Syracuse, for the ancient city in Sicily. It became a village in 1825; in 1847 it annexed Salina and was chartered as a city. Since that time, the

city has increased in area to over twenty-five square miles, the year 1927 marking the annexation of Eastwood and Onondaga Valley.

The land on which the city was built, and that adjacent to it, were originally owned by the Onondaga Indians, the name signifying "People of the Hill." The state later purchased the salt springs from the Indians and leased them to the salt manufacturers. Soon the Indians were assigned to a reservation south of the city, and they are the hereditary keepers of the Long House, the symbol of the league or government. This reservation, known as Onondaga, is the capital of the Iroquois Confederacy [see INDIANS, AMERICAN (Iroquoian)].

Syracuse is the home of the New York State Fair, held annually under the auspices of the State Agricultural Society, the buildings of which represent an investment of \$5,000,000. The city has an airport, and is a regularly scheduled stop on the air-mail route from Albany to Cleveland.

H.M.D.

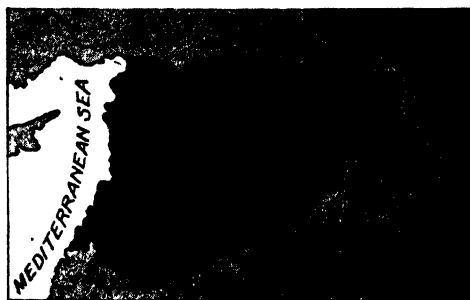
SYRACUSE UNIVERSITY, a coeducational institution, founded at Syracuse, N. Y., in 1870, partly as a continuation of the Genesee College of Lima, N. Y. (1851-1871). The medical department grew out of the Geneva Medical College (1835-1872), which in turn had succeeded the Fairfield Medical College (1812-1839). The institution is non-sectarian in administration, though it is sponsored by the Methodist Episcopal Church. Its campus of nearly 100 acres is on an elevation commanding a superb view. The university includes the colleges of liberal arts, fine arts, medicine, law, and applied science, the teachers' college, a graduate school, the colleges of agriculture, business administration, and home economics, and the New York School of Forestry. There are also schools of oratory, library training, photography, and nursing, and a summer school. The Hendricks athletic field has a stadium with a seating capacity of 30,000. The faculty numbers about 575; the student enrollment is close to 6,000.

SYR-DARYA, *seer dahr' yah*, **RIVER**. See **ARAL SEA**.

SYRIA, an independent state in Asia Minor, under mandate of France. Formerly a part of Turkey, Syria extends from the Mediterranean Sea east to Iraq, and from Turkey, on the north, to Palestine and Transjordan, on the south. Since 1925 it has comprised four territories—Syria, Alaouite, Great Lebanon, and Jebel Druze. The total area is estimated at 60,000 square miles, and the population estimate for 1925 was 2,500,000.

Modern Syria occupies a narrow strip of country wedged between sea and desert, on the one hand, and between two strong Mohammedan powers—Turkey and Arabia—on the other. The country, in general, is divided into eastern and western table-lands by a nar-

row rift valley over 400 miles in length. There are several mountain ranges along the coast, the loftiest being in Lebanon. As vapor-laden winds blowing from the sea lose their moisture on the seaward slopes of the mountains, most



THE NEW SYRIA

of the country is too dry for agriculture. The summers are long, hot, and dry; the winters are cold and snow is frequent.

The People and Their Occupations. The people are mostly of Arabic origin, and the principal foreign elements are Turks, Turkomans, Kurds, Circassians, Armenians, Persians, Jews, and a few Europeans. Arabic is the language in general use. The majority of the population are Mohammedans; there are about 500,000 Christians and 16,000 Jews. Education is provided through public elementary schools, secondary schools, and a few private institutions. There is a Syrian University at Damascus, and American and French universities at Beirut (see below, under *Beirut*).

The chief occupation is agriculture, though primitive methods prevail and only about one-fifth of the cultivable area is worked. The principal products are wheat, barley, maize, olives, silk cocoons, and cotton. Cattle-breeding and sheep-raising are important. Other industries are almost negligible; some flour, oil, soap, silk thread, wine, and tobacco are produced.

In this land, where deserts and mountains abound, travel is difficult. Railroad and carriage-road facilities are poor, but after the outbreak of the World War, the railroad system, which was controlled by the Ottoman Empire, was extended to within less than 200 miles of the Suez Canal.

History. Syria has never been a great nation, though it originally included the Holy Land, the birthplace of Christianity, and was the region in which the Israelites established themselves as a nation. Lying between two strong rival powers, it has played the part of a buffer, subject first to one great empire, then to another—Assyria, Babylonia, Persia, Macedonia under Alexander the Great, and Rome. In the seventh century A.D., it was conquered by the Arabs, and in 1099 by the Crusaders,

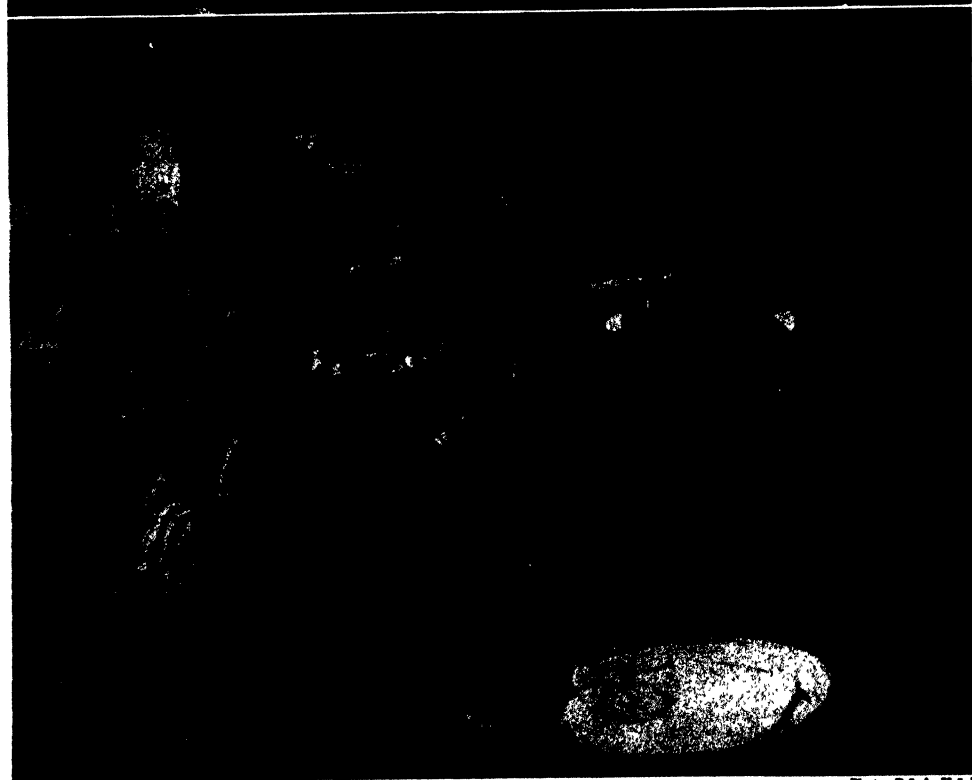
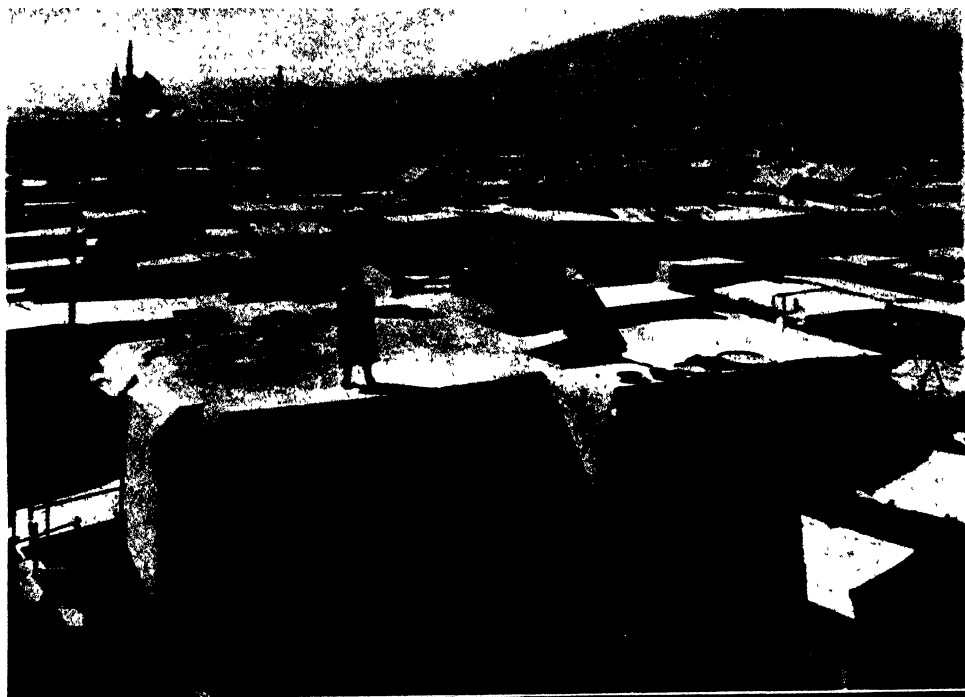


Photo: P & A; U & U

How People Live in Syria. Above, the housetops in the Mohammedan section of Damascus. (See article DAMASCUS.) Below, a Bedouin woman in the tent which is the family home; she is making butter in a churn of skins.



Photos: O R O C

Other Views of Syrian Life. Above, Christian women carrying home jars of water. Below, homes of sun-dried brick, formed in the shape of beehives. Such structures are built where stone is not available.



IN OLD PALMYRA

Syrian ruins in the ancient town. At left, columns of the Temple of the Sun. It will be noticed that the capitals of the columns are missing. They were of brass, and centuries ago were stolen for the metal. At right, a part of the Triumphal Arch at Palmyra.

who in turn were driven out by the Egyptians, in the twelfth century. In 1516 the Ottoman Turks conquered the country, and remained in possession until the World War, when they were expelled by the British.

Two years before the World War began, England and France made secret agreements regarding the partitioning of Syria and Palestine. In 1916 their intentions were made public in the Sykes-Picot agreement, by which Turkey in Asia was staked off into spheres of influence and assigned to the various Allies, France receiving Syria, and England being awarded Palestine. Syria was not consulted, nor were the plans of the Allies generally known there. English and French troops entered the territory in 1918, and were openly resented by the inhabitants, who had hoped to establish an independent state. When, in the conference of 1919, pleas for abandonment of the partitioning plans and the establishment of a free Syria were rebuffed, the presence of French and British troops became even more obnoxious. A short-lived constitutional monarchy, with Emir Faisal at the head, was set up in 1920, but continued hostilities with the French, who were determined to enforce their mandate, eventually resulted in defeat for Syria. Emir Faisal was driven out in August, 1920, and French control was established. Turkey re-

linquished sovereignty over Syria by the Treaty of Sévres, August 10, 1920, but the treaty was never ratified. In 1922 the Council of the League of Nations sanctioned the French mandate over the area. Formal confirmation was made in the Treaty of Lausanne, 1923.

The Syrians, led by the Nationalists, continued to chafe under French rule, and in 1924 and 1925, the unrest culminated in rioting and rebellion led by the Druses, a Mohammedan sect numbering about 100,000. A provisional government was formed in the Syrian territory in 1928, and a constituent assembly was elected, to draft a new constitution. The French government refused to approve certain measures proposed by the assembly, which allowed too much self-government, and the assembly was suspended. The Nationalists in Syria and the Imperialists in France are uncompromising, with the result that Syria is an unhappy mandate for France, and dissatisfaction and unrest reign.

The Cities. Damascus, the capital and largest city of Syria, is described in these volumes under its title. The remaining cities of importance are the following:

Aleppo (native form **HALEB**), of ancient origin, is an important and historic trade center, eighty miles east of the Mediterranean Sea. Except for intervals of disputed possession, it remained a part of Turkey

until the World War. It has suffered severely from earthquake and plague, but is now a picturesque, prosperous, and fairly healthful city. Located for centuries on the principal caravan route between Asia and Europe, Aleppo still has an important trade in manufactured articles, which include costly silks. Again becoming a great commercial center as in



Photo U & U

DELICATESSEN SHOP ON A DONKEY'S BACK

ancient times, it has been called "the Chicago of the Near East." There are United States and other foreign consuls here. The population is about 140,000, three-fourths of whom are Moslems.

Antioch, *an' tih ok*, was situated on the left bank of the River Orontes, twenty miles from the Mediterranean Sea, resting partly on a beautiful, fertile plain, partly on the rugged vine-clad slopes that stretched southward. It was founded in 300 B.C. by Seleucus Nicator, who ruled over a part of the divided empire of Alexander the Great, and was named in honor of his father, Antiochus. As the capital of the Greek kings of Syria, and later under Roman rule, the city, famed for its luxury, was called "the Queen of the East." At the height of its glory, it rivaled Rome and Alexandria, having a population estimated at 400,000, and was the center of an extensive commerce. Its public buildings and pagan temples were magnificent. Under the Romans the Syrian governors resided there, and it was the Eastern headquarters of Julius Caesar, Augustus, Herod, and other rulers.

Antioch was noted as one of the chief centers of early Christianity; there the Christians first received that name (*Acts* xi, 26); Paul set out on his first missionary journeys from this city, and in it were held many Church councils. Its later history was troubled. After 538, when sacked by the Persians,

the proud city never recovered its former splendor. It was seized in turn by the Saracens and the Crusaders, and finally was almost entirely destroyed by the Egyptians, in 1268; at the present time, only the ruins of its walls and aqueducts remain. The site of the ancient city is occupied by the shabby town of Antakiyeh, an important American missionary station, with Antioch College, an institution of renown. The town has a population of about 30,000.

Beirut, or *Beyrout*, *ba' root'*, has surpassed all other cities of old Turkey in commercial and industrial growth. It is the capital of the state of Great Lebanon, and the chief seaport of Syria, and is located ninety miles northwest of Damascus, at the base of the Mountains of Lebanon. The term *briar root*, applied to pipes, is generally supposed to be a corruption of *Beirut*; the town, at one time, exported great quantities of wood suitable for pipe-making. Its chief exports now are olive oil, cereals, sesame, tobacco, and wood; its manufactures are silk and cotton, and articles of gold and silver. In ancient times, Beirut was a large and important Phoenician city, but for centuries the city was passed from ruler to ruler, until 1763, when the Turks took possession. It was taken by the British in 1840, was given to Turkey, and in 1920 became a part of the new Syria. It is the seat of bishoprics of several sects, and of a Jesuit college, as well as the American University, described below. Population, 80,000.

The American University of Beirut is a privately endowed, non-sectarian institution, chartered by the Board of Regents of the state of New York in 1863. Its departments include a preparatory school, and the schools of arts and sciences, medicine, dentistry, nursing, and pharmacy. Its student body numbers about 1,200, and the faculty about 210. It includes in its enrollment students of many nationalities—Syrians, Palestinians, Mesopotamians, Armenians, Egyptians, Persians, Greeks, Abyssinians, and a few Americans. Its purpose is to furnish cultural and scientific training to the young men and women who are to be the leaders in the professional and commercial life in the Near East.

Palmyra, *pal mi' rah*, a celebrated city of antiquity, situated in an oasis in the Syrian Desert, about 150 miles northeast of Damascus. Its site is now occupied by a few Arab huts, but there still remain ruins of ancient structures that tell a story of former magnificence. Among these ruins are the remains of a splendid temple to the Sun, and those of a colonnade of marble columns that extended over nearly a mile. According to tradition, Palmyra (the Tadmor of the Bible) was founded or enlarged by Solomon. In the third century A.D., when the famous Zenobia was its queen, the city was stormed and destroyed by the army of the Roman Emperor Aurelian. It was afterward rebuilt, and as late as the fourteenth century was a prosperous trading center, but after the close of the Middle Ages, it declined into a group of hovels. See ZENOBIA. E.U.G.

Related Subjects. For further information on this subject, the reader is referred to the following articles:

Arabs	Lausanne, Treaty of
Bedouins	Lebanon, Mountains of
Damascus	Palestine
Jaffa	Sèvres, Treaty of
Jerusalem	Turkey
Jews	World War

SYRIAC, *seer' ih ak*, one of the two dialects of Aramaic (which see); most of the early manu-



Photo: Visual Education Service

SYRINGAS

scripts are versions of some part of the Bible. Down to the fourteenth century, the language had a vigorous life.

From the fourteenth century, however, it declined, though, to the present time, there remain in the Kurdish mountains and neighboring localities tribes who speak a language called Syriac. This differs considerably from Syriac proper. See ARAMAIC; HEBREW LANGUAGE AND LITERATURE.

SYRINGA, *sih ring' gah*, the common name of a genus of flowering shrubs belonging to the saxifrage family (see SAXIFRAGE), of which the best-known species is the mock orange, or syringa, as it is also called. This plant is a hardy shrub that grows to a height of ten feet. It is valued in landscape gardening because of its showy clusters of white, delightfully fragrant flowers. B.M.D.

Classification. Its botanical name is *Philadelphus coronarius*. *Syringa* is also the generic name of the lilac (which see).

SYRINX, *sir' inks*. See BIRD (Song).

SYRUP, *sir' up*. See MAPLE; SUGAR; CORN; SORGHUM.

SYSTOLIC, *sis tol' ik*, **PRESSURE**. See BLOOD PRESSURE.

SZEGED, *seg' ed*. See HUNGARY (Principal Cities).

THE WORLD BOOK

MODERN ENCYCLOPEDIA PICTORIAL
COMPREHENSIVE

Tt

T, the twentieth letter in the English alphabet, derived from the twenty-second and last of the Phœnician alphabet. This was called the *tav*, or *mark*; it had practically the same value as the later Greek *tau* and the English *t*, and was made much like a capital T, except that the vertical line extended through the



crossbar. T is more closely related to *d* than to any other letter, and the two are often confused and used interchangeably in allied languages. In English, *t* has only one regular sound, but taken in connection with *i*, it is often pronounced like *sh*, providing another vowel follows the *i* in the same syllable, as in *partial*. The Anglo-Saxons, when they adopted the alphabet from the Romans, added two letters, one of which was called *thorn*, and had the sound of *th*. It was shaped very much like a capital Y, and probably because confusion arose from the likeness, the letter was later dropped, and the combination *th* was substituted for it. This digraph, as it is called, is pronounced in two ways—as in *think* or *breath*, and as in *their* or *breathe*.

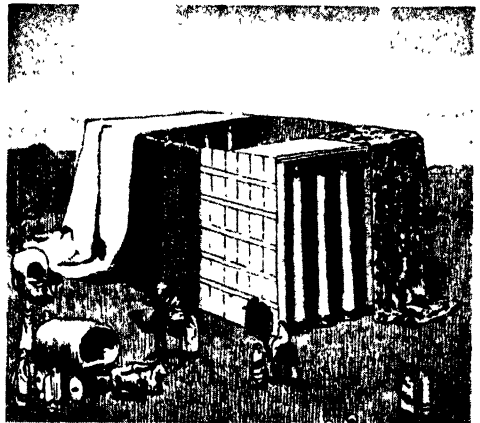
TABBY. See CAT (Cat Aristocrats).

TABERNACLE, *tab' ur nak'l*, OR **TENT OF MEETING**, the center of worship of the Israelites during their wanderings in the wilderness. Moses received instructions while on Mount Sinai for its erection (*Exodus* XXVI, 30), and the materials were provided by the free offerings of the people. It was dedicated on the first day of the second year after the Exodus from Egypt.

The tabernacle was forty-five feet long, fifteen feet wide, and fifteen feet high. Its framework was of acacia boards, overlaid with fine gold. The ceiling was of curtains of white linen, interwoven with blue, purple, and scarlet cherubim. Above this was a curtain of goats' hair, and outside of all a covering of skins. The interior was divided by the "veil," a curtain of linen similar to those of the ceiling, into the *Holy of Holies* and the *Holy Place*. The *Holy of Holies* contained the Ark of the Covenant, in which were kept the Tables of the Law, the pot of manna, and Aaron's rod that budded. Above the Ark was the "mercy seat," a cover of solid gold, surmounted by two golden cherubim. In the *Holy Place* were the table of shewbread, the altar of incense, and the golden candlestick.

The tabernacle stood within a court, 150 feet long and seventy-five feet wide, enclosed by rich curtains and supported by brass pillars.

It opened toward the east, and before it stood the altar of burnt offering, where the people brought their sacrifices to be offered by the



ERECTING THE TABERNACLE

[Drawn from illustration in *Story of the Bible*.]

priests. There was also a laver, where the priests washed their hands and feet, before entering the *Holy Place*.

The tabernacle and its furnishings were so constructed as to be easily portable. It was in the care of the Levites, who camped round

about it. Above it hovered the pillar of cloud by day and the pillar of fire by night; these were the signs of Jehovah's presence. After the conquest of Canaan, the tabernacle was set up at Shiloh, and afterward removed to Nob and then to Gibeon. From the latter place, it was brought to Jerusalem at the time of the dedication of Solomon's Temple, probably being preserved as a relic within the Temple walls. See **TEMPLE**.

In the Roman Church, the tabernacle is the receptacle in which the consecrated elements are kept.

TABERNACLES, FEAST OF, an autumn festival of the Hebrews of Biblical days, beginning on the fifteenth day of the eleventh month (*Tishri*). It lasted seven days, during which the people lived in booths, in commemoration of the time when their forefathers dwelt in tents in the wilderness. It also celebrated the ingathering of the harvest (*Deut. xvi, 13*). The dedication of the Temple by Solomon was held at the time of the Feast of Tabernacles (*I Kings viii, 65*), its length, on this occasion, being extended seven days. After the Exile, a number of rites were added, such as the ceremony of the waving of palms, the libation of water, etc. As at the Feast of Weeks and the Passover, all males were required to be present at the sanctuary during this festival. Following the final destruction of the Temple, the rabbis ordered that the celebration of the feast must be continued at the individual synagogues, and it is thus observed by the Jews to the present day.

TABLE MOUNTAIN. See **CAPE TOWN** (City); **COLORADO** (The Geology of Colorado).

TABLOID NEWSPAPERS. See **NEWSPAPER** (Historical: Tabloid Newspapers).

TABOO, *ta boo'*, also spelled **TABU**, a word of Polynesian derivation which has made its way into the current speech of civilized peoples, by whom it is employed with much the same meaning as *forbid*, *exclude*, or *ostracize*. It may be a noun, verb, or adjective, as in the following sentences:

A taboo is placed on profanity among the Boy Scouts.

The legislature will taboo any member accepting a bribe.

Coarse manners are taboo.

The practice of taboo among the Polynesians and various other primitive peoples consists in setting apart certain objects as unclean or sacred, or as having the power to injure. Such objects must not be touched. This custom prevails among tribes in America, Africa, Central Asia, and India, and has a counterpart in certain religious practices of the Greeks, Romans, and Jews.

Taboo takes various forms. There are taboos of foreigners, of innovations, of burial grounds,

of parts of one's person, of objects set apart for kings, chiefs, and priests, of sick persons, of sorcerers, and so on, indefinitely. Taboo objects are marked by various methods, such as using a piece of white cloth, a stick with dry leaves, or a bundle of branches painted red and white. The numerous restrictions imposed by the old Hebrew law in regard to sacred and unclean things were, in effect, examples of taboo.

TABOR, *ta' bur*, **MOUNT**, a mountain of Northern Palestine, which is conspicuous by reason of its isolation, rather than because of its size. Rising abruptly to a height of about 1,000 feet above the plain of Esdraelon, it stands, a wooded, shapely cone, a landmark through all Galilee. Its slopes are covered by groves and thickets of oak, walnut, and roses.

The Old Testament refers to Tabor as the site of a sanctuary, and as the place to which Barak summoned his forces for the desperate conflict with Sisera (*Judges iv*). Though it was but seven miles from Nazareth, the boyhood home of Jesus, the New Testament makes no mention of it. The early Christians looked upon it as the mount of Christ's transfiguration, and built upon it churches and monasteries, but research has proved that, during all the period of Christ's life, and for centuries before, a fortified town occupied the summit.

TABRIZ, *tah breez'*. See **PERSIA** (The Cities).

TABU. See **TABOO**.

TABULARIUM. See **CAPITOL**.

TACAMAHAC. See **POPLAR**.

TACHÉ, *tah sha'*, **SIR ETIENNE PASCAL** (1795-1865), a Canadian statesman, twice Premier of Canada and chairman of the Quebec Conference, at which the terms of Confederation were agreed upon. Taché was born at Saint Thomas, Que. When a boy he enlisted in the Canadian militia, and served throughout the War of 1812. At its close he studied medicine, and in 1819 was admitted to practice. He remained in active practice until 1841, when he entered the Canadian Assembly. He resigned in 1846 to become deputy adjutant general of the Canadian militia, but in 1848 again entered the Assembly, and in March of that year became Commissioner of Public Works. From 1849 to 1851, and again from 1852 to 1856, he was Receiver-General. In the latter year, he was appointed speaker and a life member of the Legislative Council, and by the end of the year he became Premier in the first Taché-Macdonald Ministry. In 1864 Taché and Sir John Macdonald again formed a Ministry with the former as Premier, but in both Ministries Macdonald was the real head of the government. Taché was knighted in 1858.

TACHOMETER, *tak om' e tur*. See **AIRCRAFT** (The Human Equation).

TACHYLYTE, *tak' ih lite*, the glassy variety of basic igneous rock, such as basalt. Tachy-

lytes are black, but in the thinnest sections appear brown and partially transparent, owing to the presence of bits of magnetite. They are readily susceptible to weathering. In the Hawaiian Islands, there are great masses of tachylytes, constituting lava flows of the volcanoes. More commonly, however, tachylytes occur in the form of a chilled edge to thin dikes of basalt or dolerite. The Tertiary igneous rocks of the Scottish Western Isles are largely of this type.

TACITUS, *tas' ih tus*, **PUBLIUS CORNELIUS** (about 55-120), a Roman historian, one of the greatest of all ages. Of his life, nothing is known except what may be learned from his occasional references to himself, and from a series of letters written to him by his intimate friend, the younger Pliny. Eleven of Pliny's letters now extant are addressed to Tacitus. These sources tell us only that he held various public offices under Vespasian, Titus, Domitian, and Nerva, that he won a reputation as an orator and lawyer, and that he married the daughter of Gnaeus Julius Agricola. His alliance with this distinguished soldier and statesman probably had an influence in procuring his various promotions in office.

What He Wrote. Of the writings of Tacitus there remain the following: a discussion of eloquence, *Dialogue on Orators*, his first work, published early in life, and by some critics believed not to be genuine because it contains few of the distinctive mannerisms of Tacitus; the *Life of Agricola*, a biography of his father-in-law, universally acknowledged to be a masterpiece; the *Germania*, a description of the institutions and customs of the various German tribes, written, it has been thought, to serve a political purpose, by calling the attention of the Romans to the possible danger from these neighbors; the *Histories*, of which there remain only the first four books and a part of the fifth, giving an account of the years 69-70; and the *Annals*, which originally consisted of sixteen books, giving the history of Rome and its provinces from the death of Augustus to that of Nero. Of this series, books seven to ten inclusive, with parts of others, are lost.

TACKING. See **SAILBOAT** and **SAILING**.

TACKLE. See **BLOCK** and **TACKLE**.

TACNA-ARICA, *tahk' nah ah re' kah*, **AWARD.** Tacna-Arica is a small region about the size of New Hampshire, located about midway along the western coast of South America, and for nearly half a century the object of quarrels and strained relations between Peru and Chile. Practically a desert with few natural resources, the area was under the sovereignty of Peru. About 1875, nitrate, guano, and other minerals began to be exploited in the Bolivian provinces just south of Tacna-Arica. These provinces, Antofagasta and Tarapaca, became very attractive to Chile, and, with the obvious purpose of securing possession of their valuable resources, in 1879 Chile instigated a war with Peru and Bolivia.

Victorious, Chile took over the nitrate fields, and, in order to extend its coast a little farther north, for "political, economic, and strategical reasons" offered to purchase Tacna-Arica from Peru. However, mindful that Chile had deprived Bolivia of a corridor to the sea, and fearing further encroachments on the part of Chile, Peru refused to sell, and Chile took the territory by force.

A quarrel of several years' duration followed, and in 1883 the Treaty of Ancón was signed, which allowed Chile to hold Tacna-Arica for ten years; at the end of this time, a plebiscite, or vote, was to be held, to determine the final disposition of the province. However, Chile was reluctant to risk a plebiscite in a territory originally Peruvian, and, though attempts were made to take a vote, neither side could agree on the terms or conditions, and the relations between the two countries became increasingly bitter.

In 1922 the two countries sought the aid of the United States as arbitrator, and representatives were sent to Washington. In 1925 it was decided that the long-overdue plebiscite should be held, and the difficult problem of the machinery for the vote was entrusted to a plebiscitary commission, consisting of a Peruvian, a Chilean, and an American. The commission met in Arica, but all its work was defeated, because of disagreements between the two countries.

Late in 1926, the United States again offered its services as friendly adviser, and Secretary of State Kellogg, not discouraged, worked eagerly and conscientiously to effect a settlement. When the Pan-American Conference met at Havana, in 1928, Secretary Kellogg succeeded in persuading Chile and Peru to resume diplomatic relations, that they might work out together a permanent solution to the problem; and, at the same time, he assured them of the friendly service of the United States. In May, 1929, the final settlement was announced, the main provisions of which were as follows: Chile retained Arica and Peru took Tacna; Chile was required to build, for Peru, a wharf, a customhouse at the Bay of Arica, and a station for the railroad from Tacna to Arica; Chile must deliver to Peru the sum of \$6,000,000, besides all the public works already constructed in Tacna; and private property legally acquired in the territories was to be respected by Chile and Peru. A monument will be erected jointly by the governments of Chile and Peru, to commemorate the consolidation of their friendly relations. The transfer of Tacna province to Peru was formally made at midnight, August 28, 1929, thus closing the fifty-year controversy.

TACOMA, MOUNT, the name a portion of the people of Washington (state) apply to Mount Rainier. See **RAINIER, MOUNT**.



T

The STORY of TACOMA

TACOMA, WASH., the county seat of Pierce County, is a seaport on Commencement Bay, an inlet of Puget Sound, and the center of an important lumber industry. It is in the west-central part of the state, twenty-eight miles south of Seattle and 160 miles north of Portland, Ore. The Puyallup River flows through the city and empties into the bay.

Tacoma occupies a picturesque site on uneven ground rising from the bay to a height of several hundred feet; the greater part of the city is built about 200 feet above the bay. On the west are the Olympic Mountains, and on the east the Cascades, both of which are ranges of snowy peaks and pine-covered slopes. Tacoma is the gateway to Mount Rainier National Park, fifty-six miles to the southeast, a region yearly attracting thousands of visitors. The city's scenic parks, its stadium seating

40,000, and Fort Lewis, fifteen miles south, the largest permanent army cantonment in the United States, are features of particular interest. Population, 1928, 110,500 (Federal estimate).

Transportation. Tacoma is the western headquarters and terminus of the Northern Pacific and the Chicago, Milwaukee, Saint Paul & Pacific railroads. Two other transcontinental railways serve the city—the Great Northern and the Oregon-Washington Railroad & Navigation Company of the Union Pacific system. Motorbus lines lead to Rainier National Park and the ocean, and interurban lines to various towns. The city has steamship connections with world ports.

Industries and Trade. Extensive tracts of timber furnish the basis for Tacoma's most important industry—lumbering; it is particularly noted for its manufacture of doors and furniture. The neighboring mines yield copper, gold, and silver for the



Photo: U & U

TACOMA AND A SNOW-CAPPED MOUNTAIN IN MOUNT RAINIER NATIONAL PARK

Tacoma smelters. Great flour mills consume the yield of a flourishing wheat section. There is an ample supply of electric power for industrial use in Tacoma, furnished by the two units of the municipally owned hydroelectric plant. In addition to its industrial plants, numbering more than 600, the city is a seaport whose ships trade with Europe and the Orient. Wheat, lumber, fish, and fruit are the chief articles of trade.

Institutions. Tacoma has the College of Puget Sound (Methodist Episcopal), the Annie Wright Seminary (Protestant Episcopal), and the Pacific Lutheran College. The city contains municipal and county hospitals. A short distance south is the Washington Hospital for the Insane.

History. Old Tacoma, founded in 1868, and New Tacoma, founded about 1860, were consolidated in 1883 to form Tacoma. In 1910 the commission form of government was adopted. A.H.B.

TACONIC, *ta-kon' ik*, **MOUNTAINS**, a low mountain ridge uniting the Green Mountains of Western Vermont with the Highlands of the Hudson, and forming part of the boundary between New York and Massachusetts (see **GREEN MOUNTAINS**). Equinox in Vermont (3,816 feet) and Greylock in Massachusetts (3,505 feet) are its highest peaks. Like the other mountains in this region, the Taconic are attractive, green-covered hills with rounded summits.

The metamorphosed composition of the rocks caused the American geologist Samuel F. Emmons to believe that the formations were of the pre-Potsdam age, and he called them the Taconic System, thereby introducing a new classification of strata. However, subsequent research disproved his contention, and Emmons' term is no longer used in geology.

TACTILE SENSE. See **TOUCH**.

TADMOR. See **SYRIA** (The Cities: Palmyra).

TADPOLE, a term commonly applied to the larva of an amphibian (frog, toad, salamander, etc.), from the time it hatches from the egg until it takes on the characteristics of the

mature animal. Properly, however, it is the name for the larva of a tailless amphibian (frog or toad), after it loses its external gills and before the forelimbs appear and the tail is absorbed. A tadpole, scientifically speaking, is a creature with a round head so joined to the body that the two cannot be seen as separate parts, and with a distinct, flattened tail which serves as a swimming organ. For illustration of tadpole and further details, see **FROG**. See, also, **TOAD**. M.J.H.

TAEL, *tale*, a standard coin in China. See **MONEY** (Foreign Monetary Standards).

TAFFETA, *taf'-e tah*, a plain, lustrous, closely woven, rather

stiff, but very smooth, silk fabric. The name is derived from a Persian word, *taftah*, meaning *spun* or *woven*. *Taffeta* was originally used as the name of all plain silks which were made simply by alternating the threads of the warp and the woof (see **WEAVING**). At different times, various qualities have been ascribed to taffeta; in the sixteenth century, it was "very thick and costly"; in the seventeenth, it was "very soft and thin"; and about 1750 it was described as a "lustrous silk, sometimes checkered or flowered, and sometimes striped with gold and silver."

Some of the cheaper grades of taffeta are weighted with chemicals and for that reason have a tendency to split. Chiffon taffeta is a



"THE SPIRIT OF THE GREAT LAKES"

A sculpture by Lorado Taft. (See page 6998)

lighter, softer material of excellent quality. Besides the narrow widths made as ribbons, taffeta is made in widths of thirty-six, forty, and fifty-two inches, and is used for men's shirts, for draperies, and for dresses, especially where a bouffant effect is desired. A closely woven wool fabric, used for shirts and dresses, is called *wool taffeta*.

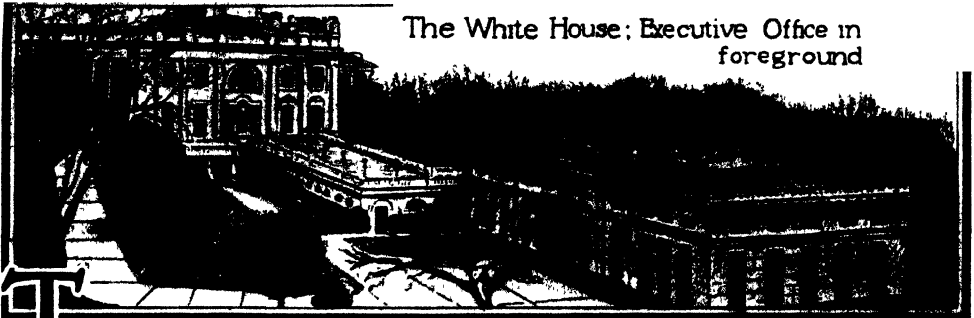
TAFFY WAS A WELSHMAN. See RHYMES OF CHILDHOOD.

TAFT, LORADO (1860-), an American sculptor, teacher, and lecturer on art subjects, whose genial personality, and clear and interesting way of presenting his subject, have won him popularity as a public speaker. He was born at Elmwood, Ill., and was graduated at the University of Illinois in 1879. After completing an art course in Paris, at the School of Fine Arts, he established a studio in Chicago, which has since been his headquarters. In 1886 he became an instructor at the Chicago Art Institute, and in that capacity has exercised a helpful influence over thousands of young people. In 1909 Taft was made professorial lecturer at the University of Chicago. Since 1919 he has been a non-resident professor of art at the University of Illinois, and each year he

gives a series of illustrated lectures which are very popular.

His work represents a blending of the ideal and realistic tendencies in sculpture. One of his best-appreciated sculptures is a symbolic group called *The Spirit of the Great Lakes*, which has been set up on the south façade of the Art Institute (see illustration on the preceding page). He also designed a remarkable colossal *Fountain of Time* for Chicago's Midway Plaisance, a boulevard connecting Jackson and Washington parks. This group represents Time as a colossal form, reviewing the marching figures in the pageant of history, and is contrary to the common conception that Time is fleeting.

Other works include *Thatcher Fountain*, Denver; *Columbus Memorial Fountain*, at Washington, D. C.; *Washington Monument*, Seattle; *The Blind*, suggested by Maeterlinck's drama; *Solitude of the Soul*, Chicago; *Black Hawk*, Oregon, Ill.; and *Alma Mater*, a statue donated by him to the University of Illinois (1929), with contributions from the alumni. He has written a *History of American Sculpture* and *Recent Tendencies in Sculpture*. See BLACK HAWK.



TAFT, WILLIAM HOWARD (1857-1930), an American jurist and statesman, the twenty-seventh President of the United States, and from 1921 to 1930, Chief Justice of the Supreme Court, a position he preferred above the Presidency, strange as the statement may appear. One unique distinction fell to him: He is the only man in the history of the United States who has been placed at the head of two of the three coordinate branches of the government.

It was the tragedy of President Taft's administration that it transformed him from one of the most popular of Americans to one who came to be misunderstood by a large number of the people. By temperament and training, Taft was a judge. The very traits which are most admirable in a judge—studious habits, deliberate decisions—were at times detrimental in a President when quick decisions and a keen grasp of new things were needed. As Presi-

dent, moreover, Taft lacked the personal picturesqueness of his predecessor, Roosevelt, with whom he was constantly compared, and often to his disadvantage. It is almost a tragedy sometimes for even a good man to follow one whom many people idolize.

After the lapse of years, the acts of the Taft administration seem less significant, and historians give more heed to its high aims and just motives, and to its real and great achievements. In the heat of political conflict, charges of bad faith and evil motives were so frequent that the essential fairness of the President's position was often lost to view. As with Grover Cleveland, so with William Howard Taft; the unpopularity of the moment later turned into lasting respect. He won the liking of all men, even political opponents.

Early Life. William Howard Taft was born on September 15, 1857, at Cincinnati, O. He was the son of Alphonso Taft and his second

wife, Louisa Torrey, both of whose ancestors joined the Massachusetts Bay Colony in the first half of the seventeenth century. Alphonso Taft was an able lawyer and a distinguished public servant. He first came into national prominence as a judge of the Cincinnati superior court, when he upheld the right of the local board of education to abolish the reading of the Bible in the common schools. Although this decision cost him the governorship of Ohio, it gave him a national reputation, which President Grant recognized when he made him Secretary of War (March, 1876) and then Attorney-General (May, 1876).

In 1874, after his graduation from the Woodward High School of his native city, young Taft entered Yale University. There he frankly set out to win honors for scholarship. It is noteworthy, however, that his attention to his studies did not keep him from becoming one of the most popular men in his class, and in his senior year he was elected to one of the exclusive, secret "senior societies," or clubs. At graduation he ranked second in a class of 121 men. Returning home, he studied at the Cincinnati Law School, and when he was graduated, in 1880, he shared first honors with one other.

Instead of entering immediately on the practice of his profession, the future President became law reporter for the Cincinnati *Times*, which was owned by his half-brother, Charles Phelps Taft (born 1843). As the son of Judge Alphonso Taft, and as the younger brother of one of the leading Cincinnati newspaper owners, he was, almost from the day of his admission to the bar, under the watchful eye of the local Republican party managers, but it was his demonstrated ability that brought him such rapid advancement that, at thirty, he ascended the bench as judge of the Ohio superior court. In the meantime, he had been assistant prosecutor of Hamilton County, collector of internal revenue, and assistant solicitor of Hamilton County. He was serving in the last office when Governor Foraker, in 1887, appointed him to fill a vacancy on the superior court. When Taft's term expired, he was reelected, but he resigned in 1890, when President Harrison appointed him Solicitor-General of the United States.

Thus, at the early age of thirty-three, Taft was second in command of the Federal Department of Justice. In this position he was given charge of the "Sayward case" before the United States Supreme Court. This was a test case brought by the Canadian government to determine the authority claimed by the United States over the seal fisheries in Bering Sea. Taft's brief was clear on every point, and convinced the court. Shortly afterward, he was called on to defend the McKinley Tariff Act, whose constitutionality was attacked, because

it had been passed by a quorum counted by the Speaker of the House of Representatives but not voting on the roll call. The Solicitor-General convinced the court of the constitutionality of the law, by pointing out the clause of the Constitution which provides that a minority in either House may "compel the attendance of absent members in such manner



WILLIAM HOWARD TAFT

In the robe of a Justice of the Supreme Court. He became Chief Justice of that court after his term in the Presidency; he preferred that post above that of President of the United States.

and under such penalties" as it may provide; this clause would be worthless if the returned members could prevent a quorum by refusing to answer to their names. In both these cases, Taft's arguments won national attention.

On the Federal Bench. In 1892 President Harrison appointed Taft to the Federal bench as judge of the sixth circuit of the newly established Court of Appeals. During the eight years in which he sat on the bench, Judge Taft became a national figure, particularly for his decisions regarding railroads and organized labor. These decisions were noteworthy for the open-mindedness with which he dealt justice to both capital and labor. Perhaps the most important case which Judge Taft decided was one involving the Addyston Pipe & Steel Company. This was a suit by the Federal gov-

ernment to break up a monopoly in cast-iron pipe. In his opinion, Judge Taft reviewed the history of this typical trust, and showed that it was, in fact, a combination which aimed at and had succeeded in placing restraints on the trade in cast-iron pipe. The decision was all the more important because the case involved the three principal illegal features—restraint of trade in interstate commerce, conspiracy, and fraud—and also because it had been preceded by a number of cases in which the government



ELECTION MAP OF 1908

The states shown in black gave their electoral votes to Bryan, Democrat; in the shaded area, to Taft, Republican. The light areas were at the time non-voting territories.

had been defeated. Taft's opinion was so complete that the United States Supreme Court, when it refused to set aside the judgment, incorporated it bodily in the decree of affirmation. In 1894 Judge Taft granted an injunction against one F. W. Phelan, because the latter, as the agent of Eugene Debs, was endeavoring to tie up railroad traffic, and about the same time he delivered a decision declaring the secondary boycott illegal.

Governor of the Philippine Islands. In 1900, at the close of the Filipino insurrection, President McKinley appointed a civil commission, partly to investigate conditions and partly to govern the islands. Of this commission, Judge Taft, against his desires, was made chairman. With the four other members, he made a tour of the islands to learn their needs at first hand. As a result of this investigation, civil government was restored on July 4, 1901, and Judge Taft became the first civil governor. During the four years for which he held this office, he not only carried out the work he was sent to do, but made himself popular among both the natives and the American residents, and won a high reputation as a colonial administrator. After order was restored, Governor Taft introduced, one by one, minor civil courts in various parts of the island, a new system of land records, records of vital and social statistics, sanitary regulations, common schools with Americans as teachers, and many other im-

provements. One of the greatest achievements of his administration was the successful negotiation, with Pope Leo XIII, for the purchase of the friars' lands, vast tracts owned by the four Roman Catholic missionary orders established in the islands. In order to complete these negotiations, Governor Taft made a successful trip to Rome.

In the Cabinet. In 1903, in the midst of his work in the Philippines, Governor Taft was offered a place on the Supreme Court of the United States, a place he much desired. His reply to President Roosevelt reveals the heavy responsibility which rested on him, and, by inference, shows the vast influence he had won in the islands among the natives. It was as follows:

Great honor deeply appreciated, but must decline. Situation here most critical from economical standpoint. Change proposed would create much disappointment and lack of confidence among people.

A year later, however, he accepted the Secretaryship of War in President Roosevelt's Cabinet. Great progress had been made in the islands in the year, so that the change was less hazardous. As the islands, too, were under the direction of the Secretary of War, Taft's experience proved most valuable. Far from restricting his activities to office work, his new position widened his range. He was soon recognized as the spokesman of the administration, and represented it on many occasions. In 1906 he served temporarily as Governor of Cuba, after the intervention of the United States in the affairs of that infant republic. A year later, he visited the Panama Canal Zone, and established American government there. In the same year, he made a trip around the world, primarily for the purpose of attending the opening session of the Philippine Legislative Assembly. He also visited Japan and China, and diplomatically disposed of several problems which had caused complications in the relations of the United States with those countries.

Candidate for President. It was about this time that President Roosevelt let it become known that he favored the nomination of Taft in 1908 as the Republican candidate for President, and in the months immediately preceding the national convention, the President's influence was ardently thrown in favor of his Secretary of War. In a public statement, Taft had previously said:

... my ambition is not political; I am not seeking the Presidential nomination; I do not expect to be the Republican candidate.

Taft's own popularity, added to President Roosevelt's influence, easily gave him the nomination, by a vote of 702 out of 980 delegates, on the first ballot. His running mate was James

S. Sherman of New York, a well-known member of the House of Representatives. The Democratic candidate was William J. Bryan, already twice defeated. The campaign was not very exciting, and Taft and Sherman were

elected (November, 1908) by 321 electoral votes to 162 votes for Bryan and John W. Kern. The popular vote was 7,679,006 for Taft to 6,409,106 for Bryan—a Republican plurality of 1,269,900.

The Administration of William Howard Taft

The Payne-Aldrich Tariff Law. During the campaign and the months immediately following his election, President Taft was generally believed to be progressive. The fact that he had President Roosevelt's support was assumed as evidence that the Taft administration would proceed along the same lines of policy as had its predecessor. But such did not prove to be the case. After his inauguration, President Taft at once called Congress in special session to revise the tariff. The popular sentiment was unquestionably in favor of "revision downward," but the Payne-Aldrich law, as finally passed, made few important reductions and a considerable number of increases in duties. Even the President admitted that the law was too strongly protectionist, and that it did not comply with the spirit of the Republican platform, upon which he had been elected. He approved it, nevertheless.

Important Legislation. In view of its amazing political results, the Payne-Aldrich Tariff is perhaps the outstanding legislative feature of the administration. The administration should be judged, on the contrary, at least partly on the constructive measures passed. These included the establishment of the postal savings-bank system (1910) and the parcel post (1912); the organization of a Commerce Court and the enlargement of the powers of the Interstate Commerce Commission (1910); acts requiring publicity for campaign contributions for Federal elections; and acts providing civil government for Alaska and creating the Department of Labor. In 1912 Congress passed an act exempting American-owned ships from the payment of tolls for passage through the Panama Canal. This law caused foreign complications, and the exemption clause was repealed in 1914. Another interesting bill, which was vetoed by President Taft in 1912, provided a literacy test for immigrants.

Foreign Relations. For its achievements in diplomacy, the Taft administration ranks among the highest in the history of the United States. It was constantly facing difficult problems, and these were settled to the benefit of the United States. In 1909 the second American occupation of Cuba came to an end, and in the same year a long-standing dispute with Venezuela was submitted to the Hague Tribunal. Secretary Knox, in 1910, proposed to the various nations that the Hague Tribunal be made a permanent court of arbitration. At the same time, he was negotiating arbitration

treaties with France and Great Britain; these treaties were ratified by the Senate on March 7, 1912, but in such amended form that the President refused to submit them to the governments concerned. The year 1910 also witnessed the end of the fisheries dispute with Great Britain and the beginning of a quarrel with Russia. The latter country, by refusing to honor passports issued by the United States to naturalized Russian Jews, drove the President to abrogate the commercial treaty of 1832. Congress by resolution approved this course.

Reciprocity with Canada. One of the things on which President Taft had set his heart was the negotiation of a reciprocity treaty with Canada. An arrangement, popularly called the Taft-Fielding Treaty, was made, reducing the tariff duties on a list of commodities exchanged between the two countries. A bill incorporating these changes passed Congress in 1911, but in Canada reciprocity was defeated.

"Dollar Diplomacy." During the nineteenth century, it was customary for a nation to use diplomacy to advance its commercial interests. "Dollar diplomacy," as expounded and practiced by Secretary of State Philander C. Knox, was a reversal of this practice—it meant the use of trade and commerce to advance a nation's diplomatic prestige. A good example of this policy was the "six-power loan" to China. That country desired to enlist foreign capital. Secretary Knox did not wait for American bankers to ask for backing, but at once, in 1912, urged them to join with the European lenders, and thus secure for the United States a share in the influences working on the Chinese government.

Another example of "dollar diplomacy" was the treatment of Nicaragua and Honduras. In order to encourage American investment in the loans of these nations, the United States government obtained the right to collect taxes. The amounts collected could then be applied on the interest of the loans. "Dollar diplomacy," in few words, meant that the flag follows trade, instead of trade following the flag.

Mexican Affairs. Beginning in 1910, and continuing to the end of his term, President Taft's most serious foreign problems arose out of the disturbed conditions in Mexico. The revolution of 1910, led by Madero, resulted in the fall of Diaz, and the revolt of 1913, led by Huerta, caused the overthrow of the Madero government and the death of its chief. The

President was averse to intervention, but in an emergency, in the spring of 1911, he ordered 15,000 troops to protect the Mexican border. At the same time, he notified the Mexican government that intervention was not intended. With the Madero government the United States was on friendly terms, but President Taft, a month before the end of his term, refused to recognize the government of General Huerta, and thus left a difficult problem for his successor, Wilson.

Economic, Social, and Political Unrest. Not only in foreign affairs did President Taft's administration face serious complications. These four years, 1909-1913, are remarkable for social and political changes, some of which came suddenly, and some after years of discussion. Upheaval was apparent in many forms, in concrete changes as well as in thought. A general discontent with many political and economic conditions was evident throughout the country. The spread of prohibition and woman suffrage, the introduction of the direct primaries and the popular election of United States Senators, the extension of the initiative, referendum, and recall, the commission form of municipal government, the city manager, the frequent investigations into the affairs of trusts, the conservation movement, and, finally, the breach in the Republican party—these were all signs of the times.

Woman suffrage made tremendous strides between 1909 and 1913. Washington in 1910, California in 1911, Arizona, Kansas, and Oregon in 1912, were added to the list of states which granted full suffrage to women. These brought the total to twelve states at the end of the Taft administration. Another striking movement was the rapid spread of prohibition. As a matter of fact, only one state, West Virginia (in 1912), adopted prohibition while Taft was President, but that the movement was gathering force was revealed by the addition of five states to the "dry" column in 1914 and 1915, and by many additions to the local-option "dry" areas. One of the most significant political changes since the War of Secession was the adoption of the Seventeenth Amendment to the Constitution. It provided for the popular election of United States Senators. It was proposed in 1913, but did not become effective until after the expiration of Taft's term. Another great change was the Sixteenth Amendment, which was adopted in 1913, and authorized the levy of a direct Federal income tax. In a few years, this was to become one of the chief sources of the national revenue.

While the existing unrest thus expressed itself in certain concrete achievements, it was also revealed in a general tendency to investigate. Thus the President, by virtue of a clause in the Payne-Aldrich Act, appointed a tariff board of five members to study the making of

future tariffs. The board had no legal standing, and, unfortunately, much of its labor was wasted. Another great investigation was that conducted by the National Monetary Commission, headed by Senator Nelson W. Aldrich; out of its report grew the Federal Reserve Bank system.

The Anti-Trust Tendencies. But what will probably be longest remembered as the distinguishing feature of the Taft administration was its attitude toward the great trusts. The Attorney-General, George W. Wickersham, organized a bureau for the purpose of studying suspicious-appearing corporations and obtaining evidence against them. Suits at law and in equity were brought against about seventy trusts, including those which controlled the manufacture or distribution of sugar, beef, lumber, paper, window glass, bathtubs, wire, steel, harvesters, shoe machinery, and shipping. In 1911 the Supreme Court ordered the dissolution of the Standard Oil Company and the so-called "tobacco trust." All trusts were pursued with impartiality, with the result that more combinations were called in civil or criminal suits than had been attacked by all of Taft's predecessors since the passage of the Sherman Act, in 1890. At the same time, the spirit of the public was indicated by Congressional "investigations," none of which had results of lasting importance. The most conspicuous was the investigation of the "money trust," or the banking and financial interests. The facts disclosed were of value in framing the Federal Reserve Act and the Clayton Anti-Trust Act in the succeeding administration.

Ballinger-Pinchot Controversy. Almost at the outset of his term, President Taft identified himself, perhaps unwillingly, with the extreme conservative Republicans as against the progressive element. In the Ballinger-Pinchot dispute, he sided with his Secretary of the Interior, Richard A. Ballinger, and dismissed Gifford Pinchot from office. Pinchot had charged that the Interior Department had encouraged illegal entries for Alaskan coal lands, and in other ways had abandoned the policy of conservation of natural resources, as begun in the Roosevelt administration. Technically, Pinchot was guilty of insubordination, for which he was dismissed, but the fact that the evidence against Ballinger was strong might have justified the President in taking some other course. He, however, stood by the Secretary, who was ultimately exonerated by a Congressional committee.

The Breach in the Republican Party. During the Roosevelt administration, there had arisen a fairly sharp distinction between the conservative and the progressive elements in the Republican party. The latter generally had the support of the President, and when Taft took office on Roosevelt's recommenda-

TAFT'S ADMINISTRATION

1909

1913



Roosevelt Dam Completed

SIXTEENTH
AMENDMENT
ADOPTED
PROVIDING FOR
INCOME TAX

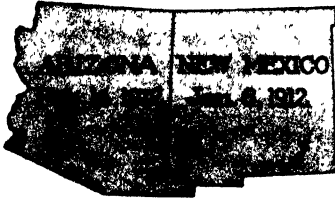
SEVENTEENTH
AMENDMENT
PROPOSED FOR
DIRECT ELECTION
OF SENATORS

PAYNE-ALDRICH
TARIFF LAW
PROTECTIVE TARIFF

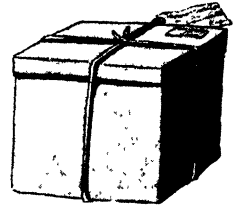
1909



Emblem of
National Progressive
Party.
Organized 1912



Two New States Admitted



Parcel Post
Organized 1913



Five More
States Adopt
Woman Suffrage



Glacier National Park
Established 1910

tion, it was assumed that he would continue Roosevelt's policies. By his defense of the Payne-Aldrich Tariff Act, however, President Taft immediately alienated the progressive Republicans. The two factions were further divided by the more or less openly avowed sympathy of Roosevelt with the insurgents, on his return from Africa. The breach between the two factions led to a Democratic victory in the Congressional elections of 1910, and gave the Democrats control of the House of Representatives. The Democrats, aided from time to time by the insurgent Republicans, carried tariff measures lowering the duties in several special schedules, and passed other laws of a "radical" nature, all of which were vetoed by the President.

The factional disputes among the Republicans continued until they became centered on the Presidential nomination for 1912. At first there were two leading candidates, Taft, as the candidate of the conservatives, and Senator La Follette, as the representative of the progressives. La Follette, however, was compelled for a time by illness to cease active campaigning. At this juncture, ex-President Roosevelt, at the invitation of the governors of seven states in which the "insurgents" were particularly strong, announced himself as a candidate for the nomination. At first dignified, the contest later became a warfare of personalities, with charges and countercharges freely hurled.

The Republican national convention, meeting in June at Chicago, was controlled by the Taft delegates. It was a scene of turmoil from the first day, the Roosevelt spokesmen contesting the admission of many of the Taft delegates. Most of the protests were ignored, and the Taft delegates were seated. The Roosevelt leaders resisted, and declared that the nomination rightfully belonged to their leader. Defeated on every point by the rulings of the national committee and the chairman of the convention, Elihu Root, the Roosevelt delegates refused to take part in the proceedings of the convention. On its last day, they held a mass meeting and nominated Theodore Roosevelt by acclamation as the candidate of a new Progressive party. In August a formal convention ratified the nomination and completed the organization of the party.

The campaign thus became three-cornered, for the Democrats, in the meantime, had nominated Governor Woodrow Wilson of New Jersey. The defection of the Progressives split the Republican party in two, and practically insured the election of Wilson. The chief features of the campaign were the attacks of the Republicans and Democrats against Roosevelt, and the latter's emphatic replies. In October, while the campaign was at its height, Roosevelt was shot by an irresponsible man in Milwaukee, and was compelled to cease active

campaigning. The election gave Taft only eight electoral votes, those of Vermont and Utah, against eighty-eight for Roosevelt and 435 for Wilson. The popular vote was 6,286,214 for Wilson, 4,126,020 for Roosevelt, and 3,483,922 for Taft.

Other Events. Two states, Arizona and New Mexico, were admitted during this term, both in 1912. The admission of these was delayed for months because the President vetoed the joint resolution for their admission. He disapproved a provision in the Arizona constitution for the recall of judges, and it was not until that provision was eliminated that he signed the proclamation of admission. The completion and dedication of the Roosevelt Dam in Arizona constituted an event of national interest. In New York, in 1909, was held the Hudson-Fulton Celebration to commemorate the three-hundredth anniversary of the discovery of the Hudson River and the centennial of Fulton's *Clermont*, the first steamboat. Another great public playground, Glacier National Park, was opened in 1910.

An Honored Ex-President. In the last months of President Taft's administration, public confidence in him seemed to be more or less restored. He took his defeat for reelection with a calm which was characteristic of him. On his retirement from office, he accepted the Kent professorship of law at Yale University, and in the same year was elected president of the American Bar Association. He continued to speak on questions of the day, and was on several occasions a severe critic of President Wilson's foreign policy. In 1916 he became chairman of the central committee of the American Red Cross.

In 1917 Taft did much to uphold the Wilson administration in its war preparations. He was chosen president of the American branch of the League to Enforce Peace, an organization whose object was to prevent, or at least reduce, the possibility of war, by threatening to use the combined economic and military strength of the nations of the League against any nation which should make war without first trying negotiation and conciliation. The office of Chief Justice of the Supreme Court, to which President Harding appointed Taft in 1921, was a fitting climax to an already illustrious career. He died March 8, 1930, and was buried at Arlington National Cemetery. E.D.F.

In Literature. Though not as facile with his pen as Theodore Roosevelt, Taft was a writer of distinction on political and economic subjects. He wrote *Four Aspects of Civic Duty; The United States and Peace; Popular Government; Ethics in Service; The Presidency Its Duties, Opportunities and Limitations; Taft Papers on League of Nations*; and other volumes.

Helen Herron Taft (1861-), daughter of Judge John W. Herron of Cincinnati. Before her marriage, in 1886, Helen Herron was a talented musician; she was a founder of the Cincinnati Orchestra. All of

OUTLINE AND QUESTIONS ON WILLIAM HOWARD TAFT

Outline

I. Preparatory Years

- (1) Birth and family
 - (a) Father a distinguished jurist
- (2) Education
 - (a) College aims
 - (b) Law study
- (3) Early legal practice

II. Public Life

- (1) State judiciary offices
- (2) As United States Solicitor-General
 - (a) Important cases
- (3) On Federal bench
 - (a) Important cases involving capital and labor
- (4) As governor of the Philippines
 - (a) Excellence as administrator
 - (b) Introduction of reforms
- (5) As Secretary of War
 - (a) Spokesman of the administration
- (6) Election to Presidency
- (7) Yale Professor
- (8) Chief Justice

III. Administration

- (1) Domestic affairs
 - (a) Payne-Aldrich Tariff Law
 1. Dissatisfaction
 2. Political results
 - (b) Establishment of postal savings bank

- (c) Parcel post established
- (d) Organization of Commerce Court
- (e) Prosecution, under Anti-Trust Law
 1. Dissolution of Standard Oil Company

- (2) Foreign relations
 - (a) Occupation of Cuba ended
 - (b) Venezuela dispute submitted to Hague tribunal
 - (c) Fisheries dispute with Great Britain
 - (d) Commercial treaty with Russia abrogated
 - (e) Canadian reciprocity question
 - (f) "Dollar diplomacy"
 - (g) Mexican trouble
- (3) Internal and local affairs
 - (a) Spread of prohibition and woman suffrage
 - (b) Ballinger-Pinchot controversy
 - (c) Admission of two states
 - (d) Hudson-Fulton Celebration
 - (e) Dedication of Roosevelt Dam
 - (f) Glacier National Park opened
 - (g) Breach in Republican party
 - (h) Election of 1912

IV. Later Years

- (1) Professorship at Yale University
- (2) Chairman of Red Cross committee
- (3) The League to Enforce Peace
- (4) Writings

Questions

What was meant by "dollar diplomacy," and in what way was it in effect a reversal of the previous practice?

Explain Taft's clever use of a clause from the Constitution to establish the constitutionality of a Federal act.

To what, primarily, was Taft's election to the Presidency due?

What "playground" did the nation have at the close of this administration which it did not have at the beginning?

What political party was founded during this administration? Give the circumstances of its birth.

Who was Gifford Pinchot, and what part did he play in the history of this administration?

What other President was very popular at the beginning of his term and extremely unpopular at the end? What similarity is there in the later life of these two Presidents?

How did Taft's avowed purpose on entering college differ from that of his predecessor?

What unique distinction does Taft enjoy?

What was his record during the World War?

What is his connection with international peace?

her talents, especially those as a hostess and house-keeper, were required during the years following her marriage, for her husband's progress was rapid. The strain of the social routine of the White House proved too much for her rather frail health, and, in spite of her remarkable will power, Mrs. Taft suffered a breakdown in 1909. For a year she was very ill, and during that time her sister, Mrs. Louis More, wife of a professor at the University of Cincinnati, acted as White House hostess. Mrs. Taft inaugurated the custom of five o'clock teas at the White House.

Her children are Helen Taft Manning and two sons, Robert Alphonso Taft, and Charles Phelps Taft II.

Related Subjects. The reader who desires additional information respecting events connected with the life and times of this President is referred in these volumes to the following articles:

Banks and Banking	Philippine Islands
Bering Sea Controversy	(History)
City Manager	Political Parties
Commission Form of Government	Prohibition
Conservation	Recall
Initiative and Referendum	Reciprocity
Labor, Department of	Roosevelt, Theodore
Mexico (History)	Supreme Court
Parcel Post	Tariff
	Trust

TAGALOG, *tah gah' log*. See PHILIPPINE ISLANDS (Language and Education).

TAGORE, *tah gohr'*, SIR RABINDRANATH (1861-), an Indian (Bengalese) poet, philosopher, and religious teacher, winner of the Nobel prize for literature in 1913. For twenty-five years before this award made his name familiar throughout Europe and America, he had been the prophet of his countrymen, one of whom said, "He is the first among our saints who has not refused to live, but has spoken out of life itself, and that is why we give him our love." His patriotic poems and songs helped to develop a racial and national consciousness, and won for him the name, "the Soul of Bengal."

In the beauties of nature—a cloud, a flower, a bird—he sees God. All his creations, whether



Photo U & U

HELEN HERRON TAFT

poems, dramas, stories, essays, or lectures, deal with the things of the spirit, and contain something of that typical Hindu reverence which led his parents to send him, as a boy of eleven, into the Himalaya Mountains, that he might grasp the insignificance of the individual and the grandeur of solitude and space. His expressive language and unusual sentence structure draw pictures which stir the imagination. Tagore is primarily the interpreter of the East, and rarely shows the influence of Western civilization. When seventeen years of age, he attended school in England, and he has traveled in Europe and also in America, where he lectured in 1916 on "Internationalism." He has translated many of his own works into English; all these retain the feeling of the original, and a number have excellent technique.

Representative Titles. The most important of the translations are *Chitra*; *The Crescent Moon*; *The Gardener*; *Gitanjali* (Song Offerings); *King of the Dark Chamber*; *Post Office*; *Thought Relics*; and *The Wreck*.

TAGUA, *tah' gwah*, **PALM**. See IVORY PALM.

TAGUS, *ta' gus*, **RIVER**. See SPAIN (Rivers and Lakes).

TAHITI, *tah' he te*, **ARCHIPELAGO**. See PACIFIC ISLANDS.

TAHOE, *ta' ho*, or *tah' ho*, a beautiful glacial lake on the boundary between California and Nevada, the largest body of water in the Sierra Nevada range. The mountains of two states, those on the Nevada shore, gray and rugged, and those on the California side, stately and verdant, are mirrored in its dark-blue waters. The outlet of the lake is in the rushing Truckee River, which carries the overflow to a "sink" known as Pyramid Lake, where the water evaporates. The woods of the adjacent slopes are filled with game, and the lake and swift mountain torrents abound with fish, making the region a paradise of the sportsman, as well as the delight of the tourist. Lake Tahoe is a popular summer resort, and in its vicinity are many attractive homes and fine hotels. The lake is oval-shaped, and is about twenty miles long and half as wide. It has an elevation above sea level of 6,225 feet, and an average depth of 1,500 feet. See CALIFORNIA (Waters).

TAI HAN, *ti' hahn*. See CHOSEN.

TAILOR BIRD, a song bird of India, Malaysia, and the Philippines, so named from its habit of enclosing its nest within a large leaf, which it sews together at the edge, with its slender bill. The nest itself is made of plant down, fine grass, hair, etc., and is ingeniously sewed together with bits of silk or wool threads or with vegetable fiber, for which the bird searches most diligently. The eggs are three or four in number, varying in color from reddish-white to bluish-green, boldly marked with brownish-red. This bird has back plumage of

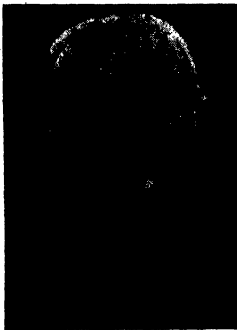
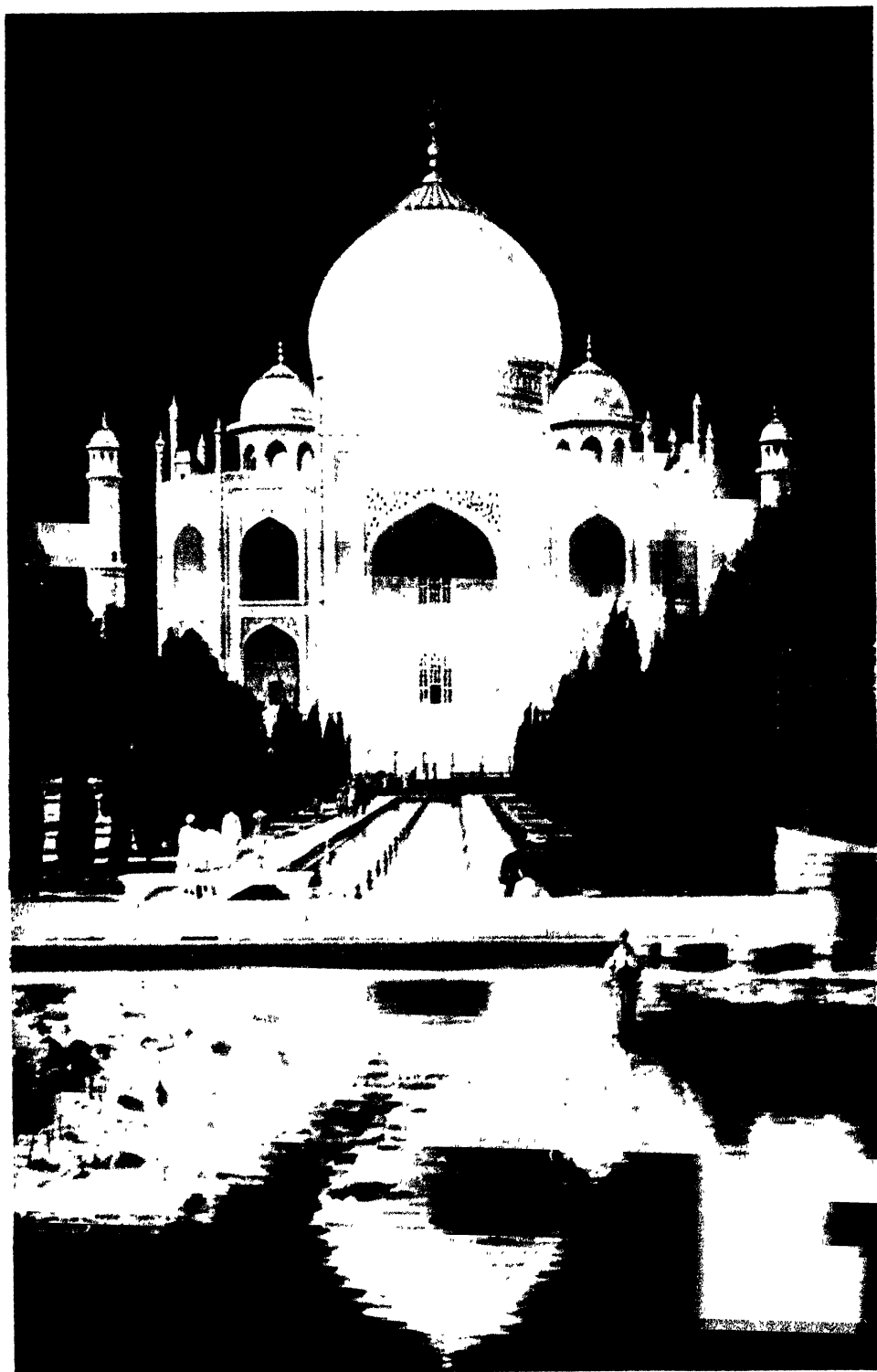


Photo: Wide World

TAGORE



THE INCOMPARABLE TAJ MAHAL

olive-green, white under parts, and a chestnut crown.

D.L.

Scientific Name. The tailor bird belongs to the warbler group. Its scientific name is *Sutoria sutoria*.



TAILOR BIRD AND NEST

TAINE, *tayn*, **HIPPOLYTE ADOLPHE** (1828-1893), a French historian and critic, born at Vouziers. He was a student from his childhood, and by the time he was fourteen years old, he had drawn up a schedule for his day's work to which he held rigidly—twenty minutes for play in the afternoon, an hour for music after dinner, and all the rest of his waking hours for study. The results of his intense application were seen when he entered the École Normale, where he speedily distinguished himself. In 1851 he was made professor of philosophy in the College of Toulon, but he soon resigned the position, to give his time to study and literary production.

In December, 1863, his celebrated *History of English Literature* appeared; this has been translated into many languages, and it ranks as one of the greatest works of its kind. In the next year, he was appointed by the government, which had previously feared him because of his attitude toward Napoleon III, to a professorship in the École des Beaux Arts, where he distinguished himself by a series of excellent lectures on art. He continued to write critical studies on literature, art, and history, producing in the last fifteen years of his life his great work, *Origins of Contemporary France*, in which he discussed the causes of existing conditions in France. In 1878 he was made a member of the French Academy. Taine was above all things logical, and all of his work is marked by the most accurate analysis.

TAI-PING, *ti ping'*, **REBELLION**. See **CHINA** (History: Increased Intercourse with the World).

TAIWAN, *ti wahn'*, another name for Formosa (which see).

TAJ MAHAL, *tahzh mah kahl'*, the costliest private tomb in the world, built by the Indian ruler Shah Jehan (which see), as a final resting place for the remains of his favorite wife, Mumtaz-i-Mahal, "the pride of the Palace." The name *Taj Mahal* is the Persian for *crown of Mahal*. This mausoleum, which some con-

sider the most beautiful building ever constructed, is one mile east of Agra. Twenty thousand men were employed in its erection, which covered a period of twenty-one years (1629-1650).

Some buildings take on added beauty under the rays of a brilliant moon or in the light of the setting sun. Of the Taj Mahal it has been said that "it requires neither moonlight or sunset; it brings its own atmosphere, its own light, 'that was never yet on land or sea.'"

The Taj Mahal is built of white marble. It stands on a rectangular platform of red sandstone, from the four corners of which rise slender minarets, or prayer towers. The building itself is an octagon, 130 feet in length and width, and 70 feet high. Above the central portion, an exquisite dome rises to a height of 100 feet. The outside of the mausoleum is adorned with passages from the Koran and ornamental designs in inlays of costly gems, and within is a central chamber containing two cenotaphs, which the spectator views through an alabaster screen of beautiful openwork. Below this chamber is the vault wherein repose the remains of Shah Jehan and his wife.

No artificial lighting is needed for the interior, for the dome is semi-transparent, and there are several windows with perforated alabaster screens. Through these the light glows with a marvelously softened effect. The structure is surrounded by a beautiful walled-in garden, the entrance to which is a superb gateway of red sandstone and white marble.

TALC, *talk*, a soft magnesium mineral commonly found in flat, smooth layers or plates (foliated), but sometimes in compact form. Soapstone, or steatite (which see), is a compact kind of talc. This mineral is so soft that it can be scratched with the finger nail. It is translucent, has a soapy feel, and is a poor conductor of heat. The foliated varieties may be white or greenish; the compact may be dark gray. Talc is used in the manufacture of crayons, porcelain, furnace linings, heating stoves, electric insulation, toilet powders, such as *talcum*, and other commodities. French chalk, used by tailors, is a fine granular variety serviceable for tracing lines on wood or cloth. Talc is sold in slabs and powdered form. About sixty per cent of the world's supply is produced in the United States. Vermont and New York are the leading states. Ontario produces a high-grade talc which is imported into the United States.

A.N.W.

Chemical Formula. The formula for talc is $H_2Mg_3Si_4O_{12}$; that is, a molecule contains two atoms of hydrogen, three of magnesium, four of silicon, and twelve of oxygen.

TALENT, a famous ancient coin and unit of weight. Because the best-known references to this ancient term are found in the Scriptures,

there frequently exists the impression that it was the Hebrews who chiefly made use of the talent, but such is not the case. The word occurs in the Greek of the New Testament, and it is in connection with Greek affairs that the measure is chiefly known. The Hebrews, however, did have such a weight, derived from Babylonia, and equal to 3,000 shekels in silver, or between \$1,800 and \$1,920.

Like the Hebrews, the Greeks took the talent from the Babylonians, though the name is Greek. Both in measuring weights and in giving the denomination of money, the talent was the largest Greek unit, but it was by no means uniform in different Greek states and at different times. The talent used for measuring gold, moreover, differed from that for measuring silver, and to understand references in Greek literature to talents, it is necessary to know which of the various systems is intended. Perhaps the most commonly referred to, however, is the later Attic or Solonic, which was equivalent to about fifty-seven pounds. A silver talent in Athens was worth between \$1,000 and \$1,100.

The Romans also made use of the talent, not as a coin but as a measure of money. They had a *great talent* and a *little talent*, the former worth about \$480, the latter about \$363.

[The common present-day use of the word, meaning a special endowment or faculty, is derived from the parable of the talents in *Matthew* xxv, 14-30.]

TALES OF HOFFMANN. See OPERA (Some of the Famous Operas).

TALKING MACHINE. See PHONOGRAPH.

TALLADEGA, ALA. See ALABAMA (back of map).

TALLADEGA COLLEGE. See ALABAMA (Education).

TALLAHASSEE, FLA. See FLORIDA (back of map).

TALLAHATCHIE RIVER. See MISSISSIPPI (Physical Features); YAZOO RIVER.

TALLAPOOSA RIVER. See ALABAMA (Rivers and Forests).

TALLEY, MARION NEVADA (1906-), a grand-opera singer who achieved fame, when only nineteen years of age, as a leading soprano of the Metropolitan Opera Company, New York City. Miss Talley was born at Nevada, Mo. When an infant, she was taken by her parents to Kansas City, where she was educated at the grammar and high schools. When



Photo: U & U

MARION TALLEY

ten years of age, she was soloist in a Kansas City church choir, and at fifteen played the leading soprano rôle in two local opera performances. She showed such talent that a public concert was given for her, at which \$10,000 was realized, to enable her to continue her musical education in New York City. Shortly after she had obtained a hearing at the Metropolitan Opera House, she sailed for Europe, where she remained for a year, studying French and Italian.

Upon her return, Miss Talley was coached by members of the Metropolitan Opera Company, which she joined in 1925. She made her début as Gilda, in *Rigoletto*. After the close of her first season, she went on concert tour through the United States and Canada, and before she had reached the age of twenty-one, she had sung in 120 concerts and had appeared in fifty performances with the Metropolitan Company. In 1929 she retired, to take up her residence upon a farm in the Kansas wheat region.

TALLEYRAND-PÉRIGORD, *tah leh rahN'-pa re gohr'* (in English, *tal' ih rand*), CHARLES MAURICE, Duke de, Prince of Benevento (1754-1838), a famous French statesman, born in Paris, and, next to Napoleon, the leading political character of his time. Though an eldest son, he was forced by lameness, resulting from an accident in his childhood, to give up a military career, and was destined by his family for the Church. Though he showed neither inclination nor aptitude for religious life, he continued his studies, and in 1775 was ordained. In 1780 he was made agent-general of the clergy of France, and in that position showed the administrative ability which in 1789 secured his appointment as bishop of Autun. In that same year, he was elected deputy to the States-General from Autun, and at once took rank as one of the foremost reformers.



TALLEYRAND

Supported State Above Church. Talleyrand was one of the committee appointed to draw up a Constitution, was a signer of the Declaration of Rights, and by his advocacy of the confiscation of Church lands won great popularity. Because he took the oath to the Constitution and acknowledged the supremacy of the State, he was excommunicated by the Pope in 1791, and in that same year resigned his

bishopric. Meanwhile, he had been a founder of the Friends of the Constitution, afterward the Jacobin Club, and had, in 1790, been elected president of the National Assembly; but, like Mirabeau, with whom he usually identified himself, he was not violent enough to please the radicals, and gradually lost influence. Thus, while in England on a diplomatic mission in 1792, he was declared to be one of the *émigrés* of royalist tendencies, and was forbidden to return to France. For two years he remained in England, then went to the United States, where he spent nearly three years.

Napoleon's Strong Aid. In 1796 Talleyrand was permitted to return to France, and, through the influence of Madame de Staël-Holstein, secured the post of Minister of Foreign Affairs. Seeing that Napoleon was the coming man in the country, he aided in the moves by which the Directory was overthrown and the consulate established, and as a reward was continued in his position as Foreign Minister. In this office he exerted himself to extend the power of Napoleon, who made him Grand Chamberlain in 1804, when the empire was founded. Talleyrand was the chief spirit in the formation of the Confederation of the Rhine, and in the negotiations with Prussia and Russia which, in 1807, culminated in the Peace of Tilsit. Soon after this, he resigned his office, and during the later years of Napoleon's reign became the rallying center of the discontented spirits who hoped for a return of the old monarchy. He drew up the terms of Napoleon's abdication, and at the Congress of Vienna made use of his unusual diplomatic powers to obtain concessions for France.

Talleyrand was Foreign Minister at the time that Pinckney, Marshall, and Gerry were sent by the United States to protest against unjust treatment on the high seas. It was Pinckney who hotly declared, "We have millions for defense, but not one cent for tribute."

Later Years. After Louis XVIII was established on the throne, Talleyrand took little part in public affairs, but when Louis Philippe became king, by the Revolution of 1830, he was sent as ambassador to England, and succeeded in forming a quadruple alliance among France, Great Britain, Spain, and Portugal. This was his last important public act. Before his death, he was reconciled to the Church.

Related Subjects. The following articles in these volumes will make clear certain references in this sketch of Talleyrand:

Bonaparte, Napoleon	Pinckney, Charles C.
Directory	Staël-Holstein
Émigrés	States-General
Jacobins	X.Y.Z. Correspondence
Mirabeau, Count de	

TALLOW, a hard, white substance obtained in the process of rendering animal fat, especially that of sheep, goats, and cattle. It is used extensively in the manufacture of soap,

candles, and lubricants, and for dressing skins and leathers; tallow of superior quality is employed in the making of oleomargarine.

Tallow is a mixture of the solid fats palmitin and stearin, and of the liquid fat olein. When pure, it is whiter than lard and practically tasteless, but the commercial product usually has a yellowish tinge. It will not dissolve in water, but is soluble in boiling alcohol. The best grade is obtained from fat near the kidneys of cattle. In one process of tallow-making, the suet is cut into small pieces and heated over water, until the fat has melted; it is then tried out. The tissues that are left are pressed, to obtain the tallow that may remain. Acid-rendering consists in boiling the fat with water and sulphuric acid, a process which causes the tissues to dissolve. Tallow is also produced by melting the suet in iron cylinders heated by steam under pressure. A substance similar to animal tallow is obtained from certain trees. See TALLOW TREE.

TALLOW TREE, the name of various trees which produce a waxlike substance that may be used, like tallow, for making candles. The tallow tree of China, which is the most widely distributed, has been introduced into North America, and is becoming naturalized along the coasts of Georgia and the Carolinas. At the approach of winter, the long, leathery leaves become a deep red, and among them hang the seeds, suspended by waxlike threads. The tallow, or wax, is obtained by crushing and boiling both capsules and seed, and skimming off the tallow as it rises. This substance is afterward melted and refined, and ordinary wax is added, to give a firmer consistency. It is used chiefly for candles, but a scented soap of good quality is also made from it, as it emits a balsamic odor. The leaves furnish a black dye, and the stem yields a resinous substance called *copal*, used in making varnish. The *bayberry*, or *candleberry* (which see), a small tree or shrub, also furnishes wax used in making candles. These burn slowly with a pleasant, piny fragrance, but do not give a strong light. G.M.S.

Scientific Name. The tallow tree described above belongs to the family *Euphorbiaceae*. Its botanical name is *Sapium sebiferum*.

TALMADGE, *tal' mayj*, NORMA. See MOVING PICTURES (list of players).

TALMAGE, THOMAS DE WITT (1832-1902), one of America's greatest clergymen and orators, was born at Bound Brook, N. J., educated in New York University and in the Dutch Reformed Theological Seminary, at New Brunswick, N. J., and in 1856 was ordained pastor of the Dutch Reformed Church, Belleville, N. J. He began immediately to attract notice through his remarkable oratory. In 1859 he accepted the pastorate of the Dutch Reformed Church at Syracuse, N. Y., and three years

later went to the church of the same denomination in Philadelphia. While holding this position, he also acted as chaplain in the Union army.

Talmage became pastor of the Central Presbyterian Church, Brooklyn, N. Y., in 1860, and within one year the congregation had become so large that an immense structure, known as the Brooklyn Tabernacle, was erected. There his eloquence and bold denunciation of evil attracted such audiences that even the new building was often uncomfortably crowded. He was in great demand as a lyceum lecturer, and his sermons appeared in many newspapers.



Photo: Brown Bros.
T. DE WITT TALMAGE

Between 1872 and 1894, the Tabernacle was burned three times. In the latter year, Dr. Talmage became associate pastor of the First Presbyterian Church at Washington, D. C., but resigned in 1899 to devote all his time to writing.

Writings. He was author of such popular religious books as *Every Day Religion*, *The Almond Tree in Blossom*, and *From Manger to Throne*.

TALMUD, the book of Jewish civil and religious law, aside from the Pentateuch. It had its beginnings in the time of Ezra, the period following the Exile, when new conditions of national life called for new laws. Decisions were made from time to time by those in authority, which, as centuries passed, grew into the mass of tradition known as the *Oral Law*. In the times of Jesus, the scribes and Pharisees required strict observance of all the details of this Law, but the Sadducees opposed it, declaring their only authority to be the Pentateuch. After the rise of Christianity and the destruction of Jerusalem by the Romans, pious Jews turned their zeal toward putting the Oral Law into writing. This work was completed at the close of the second century, and formed the part of the Talmud known as the *Mishna*, meaning *instruction*. After this, scholars commented on the *Mishna*, preserving their work in the second part of the Talmud, known as the *Gemara*. There are, in reality, two *Gemaras* extant, the Palestinian and the Babylonian, the latter being the larger and more trustworthy. It was completed in the sixth century. The *Mishna* was written in Hebrew; the commentaries, in Aramaic.

These Jewish works, though opposed to Christianity, did much to stimulate Christian

thought of the Middle Ages, and must be given a part of the credit for the German scholarship that made possible the Protestant Reformation. Students to-day find in them much interesting matter concerning Jewish manners and customs in Bible times. See HEBREW LANGUAGE AND LITERATURE.

TALON, *la lohN'*, JEAN BAPTISTE (1625-1691), a French official in Canada, one of the ablest of the men who created New France. He was born in Picardy, France. After his employment in the civil service of France, for some years, in 1663 he was appointed "intendant of justice and finance" for the French possessions in North America. Talon was able and energetic. He built a ship at the king's expense, in order to show the people how to build ships. He sent out engineers to search for coal, copper, lead, and other minerals, and he himself made shoes and woolen cloth, as an example to the colonists. He also gave much aid and encouragement to the Jesuits in the explorations and missionary enterprises on the shores of the Great Lakes. One of his orders provided that bachelors should not hunt, fish, or trade with the Indians, the obvious purpose of this order being to encourage permanent settlement by families.

What He Wrote. A book by Talon, *Memoire à Sa Majesté sur l'état présent du Canada*, published in 1667, is a valuable record for the history of New France.

TALUS, *ta' lus*, an accumulation of rock waste, heaped against the base of, or covering a slope below, a cliff, and derived from the breaking off, by weathering, of material from the face of the cliff. A talus may consist of earth, sand, gravel, or large rock fragments, depending upon the material of which the cliff is formed and upon the mode of weathering. The material may be loosened and dislodged through soaking by rain, or through alternate freezing and thawing. In regions of scanty rainfall, the rocks may be broken down through intense heating by the sun's rays during the day, followed by sudden cooling after nightfall. In colder climates, a powerful agent in the weathering of cliffs is the splitting off of fragments by the expansion, upon freezing, of water in crevices in the rock. Taluses are striking features of the landscape in many mountainous regions. In the British Isles, they are more commonly known as *scree*s. See EROSION; GEOLOGY; SOIL (Formation). L.LaF.

TAMAQUA, *tah maw' kwah*, PA. See PENNSYLVANIA (back of map).

TAMARACK, the name applied in the Western and Middle United States to the *American larch*. In New England and Canada, it is known by the local name *hackmatack*. The tree is described in these volumes under the title LARCH. G.M.S.

TAMARIND, a large, tropical tree of the pulse family of plants, cultivated for ornament and utility. Its fruit, a brown pod from three to six inches long, is filled with an acid, juicy pulp which is used in India to make cooling beverages, such as sherbet. This pulp is shipped in large quantities to European countries, being packed in layers in casks. Boiled in sugar or syrup, it becomes the preserved tamarind of commerce. Tamarind seeds are used to make a yellow or red dye, and the root of the tree furnishes a beautiful hard wood, valued for cabinetwork, though fashioned with difficulty. The tree itself is very attractive, with wide-spreading branches and light-green foliage. It is widely distributed in warm countries, but has not been successfully cultivated anywhere in the United States, except in Florida. G.M.S.

Scientific Name. The tamarind tree belongs to the family *Leguminosae*. Its botanical name is *Tamarindus indica*.

TAMATAVE, *tah mah tah' vay*, a seaport of Madagascar (which see).

TAMBOURINE, *tam buh reen'*, an ancient musical instrument constructed on the principle of a drum, consisting of a circular wooden or metal frame about two inches deep, across the top of which is stretched a piece of tightly drawn parchment. Little bells are attached to the hoop, and these jingle when the parchment is struck. The tambourine has no musical pitch, but is used merely to beat rhythm. The performer plays it by striking the parchment with the knuckles or elbow. Spanish and Italian peasants and gypsies use it for their dances, shaking it to make the bells jingle, or hitting it against the foot while dancing. It is invariably found in Salvation Army bands, and is also used to take up collections. This instrument is similar to the *timbrel* of the Old Testament.

TAMERLANE. See MONGOLS; TIMUR.

TAMING OF THE SHREW. See SHAKESPEARE, WILLIAM (Synopsis of the Plays).

TAMJURT, a peak of the Atlas Mountains (which see).

TAMMANY SOCIETY, also called THE COLUMBIAN ORDER, was founded in New York City, May 12, 1789, by William Mooney. He had been a soldier in the Revolutionary War, and started the organization as a "fraternity of patriots solemnly consecrated to the independence, the popular liberty, and the federal union of the country." The original members were those who, before the war, had been members of the "Sons of Liberty" and "Sons of Saint Tammany," societies which were organized to promote the cause of independence.

The organization of the society was by tribes, one for each of the thirteen states. The nomenclature was selected from words and phrases of the Delaware Indians, the name Tammany having been adapted from that of an Indian

chief. The members were called *braves*, the place of meeting was the *wigwam*, and the thirteen states were named *Eagle*, *Panther*, *Deer*, etc. The head officer of each tribe was a *sachem*, and the head of the national organization was the *grand sachem*. The honorary title of *great grand sachem* was conferred upon Washington and his successors for a time, but was abolished at the close of Jackson's administration. The master of ceremonies was called *sagamore*, and "Freedom our Rock" was adopted as the Society's motto. The Tammany Society as early as 1820 stood for manhood suffrage, without property qualifications.

After the government had tried, but failed repeatedly, to conclude a treaty of peace with the warlike Creek Indians, the Tammany Society undertook the task of conciliation, and brought the chief and twenty-eight of his warriors to New York City for a banquet, in August, 1790. Themselves dressed in full Indian costume, the Society's members escorted the Creeks to a conference with President Washington. The result was the signing of a treaty the next day.

The New York Historical Society, the Academy of Design, and many other educational institutions were founded or fostered by Tammany. On April 13, 1808, the Society marched in a body to Wallabout Bay, and laid the foundation stones for a mausoleum, where they later deposited the bones of 11,600 Revolutionary patriots. In the War of Secession, the grand sachem of Tammany, William D. Kennedy, led a regiment composed of members who were equipped by the organization.

The Society in Politics. Although the organization existed for many years for patriotic purposes, it soon came to have a twofold existence—patriotic and political—with the leadership of both elements in the same hands. Tammany Hall, the home of the Society, was eventually leased to the political element in its membership, with the privilege also of using the Society's name. For half a century, Tammany has been recognized solely as a political machine, wielding vast power, perfect in its organization, and determined to control the government of the city and state of New York.

Numerous scandals have darkened its history, the most notable one occurring in 1871, when Tammany Hall was under the leadership of William M. Tweed. Far-reaching bribery and corruption were charged against the organization, and Tweed was eventually sent to prison. About twenty-five years later, the power of Tammany spread until its influence was felt in national affairs, but its effort to dominate national politics has never been successful. Among Tweed's successors as leaders of Tammany have been Richard Croker, Charles F. Murphy, and George W. Olvany. Fully half of the time since the days of Croke,

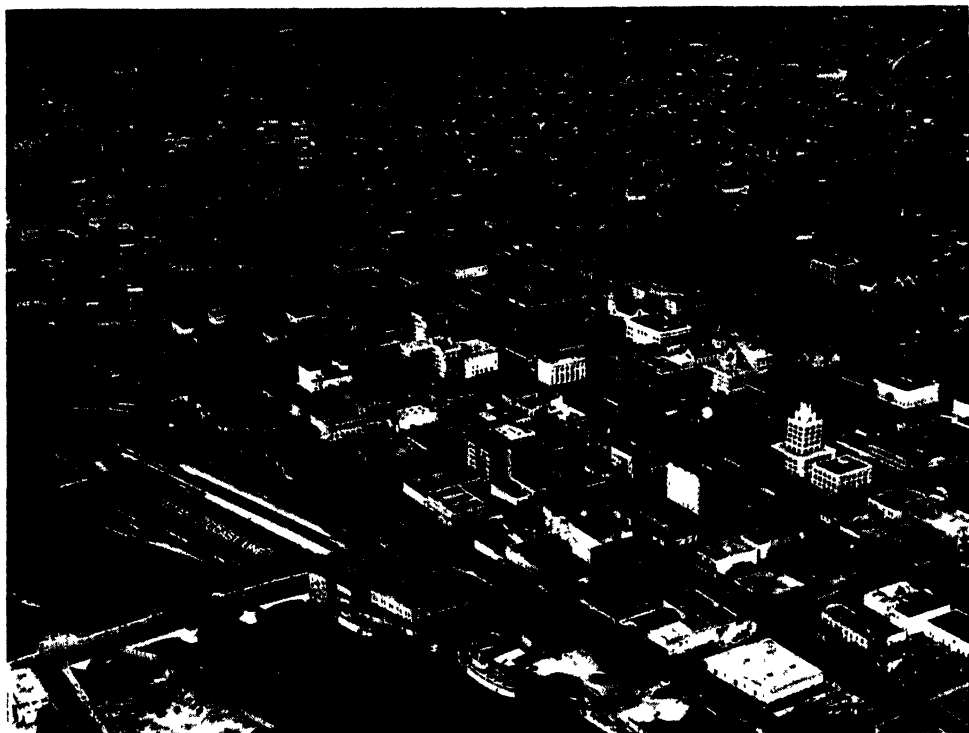


Photo: U & U

AIRPLANE VIEW OF TAMPA

Tammany has had control of the administration of affairs in New York City, and has at times dominated the legislature at Albany. The present Tammany Hall exists because of its influence over the masses of people on the East Side of New York City and across the river in Brooklyn, a part of Greater New York where it exercises an almost paternal care of what this mass of voters believe to be their material interests. See, also, TWEED, WILLIAM MARCY.

TAMMERFORS, *tahm ur fors'*. See FINLAND (The Cities).

TAMPA, FLA., an industrial, commercial, and agricultural center on the western coast, is the county seat of Hillsborough County. It is situated on old Tampa Bay, at the entrance of the Hillsborough River, 212 miles southeast of Jacksonville.

Because of its pleasing location and mild climate, Tampa has become a favorite winter resort. The magnificent Tampa Bay Hotel, owned by the city and operated under lease, is open to tourists during the winter season. Population, 1928, 113,400 (Federal estimate).

Transportation. A network of railroads, provided by the Atlantic Coast Line, the Seaboard Air Line, and their subsidiaries, connects Tampa with railroad centers throughout the United States. Steamship lines operate from Tampa to the Orient, South

America, and the East and West Indies, as well as to other North American ports.

Industries. Tampa has over 540 industrial concerns, representing scores of different lines. Its chief industry is the manufacture of clear Havana cigars, an average of almost 500,000,000 being turned out annually. Next in importance come phosphate products, cement, automobile tires, foodstuffs, citrus products, chemicals, and clothing.

History. The settlement of Tampa began with the establishment of an army post, about 1850. During the War of Secession, it was taken by the Federals, and here, in De Soto Park, the United States Volunteers encamped during the Spanish-American War. In 1886 railroads were constructed to the city, the cigar-manufacturing industry was established, and the city charter granted. The city is governed under a city-representative plan. E.I.

TAMPICO, *tam pe' ko*. See MEXICO (Principal Cities).

TAMPU TOCCO. See INCA.

TANA, *tah' nah*, a river of Norway. See NORWAY (Rivers and Lakes).

TANAGER, *tan' a jur*, the common name of a family of American birds noted for the brilliance of the male plumage. They are from six to eight inches long, and are usually found in the forests, where they feed on insects, fruit, and flowers. The tanagers dwell chiefly in the



Photo: U & U

THE GANDY BRIDGE AT TAMPA

It is declared to be the longest automobile toll bridge in the world. The structure spans Old Tampa Bay, and connects Tampa and Saint Petersburg. It is nearly six miles long. For the saving in miles of travel between the cities named, see the map of Florida.

tropical regions of Central and South America, and only four or five species reach the United States in their migrations northward. Of these

olive-green above, with darker wings and tail. The nest is a frail, saucer-shaped structure, placed near the end of a horizontal limb, and the eggs, three to five in number, are pale bluish-white or bluish-green, with reddish-brown markings. The scarlet tanager has a loud, cheery singing note, something like that of the robin.

A familiar summer bird of the Southern states is the *summer tanager*, easily recognized by its rose-red plumage. It has much the same nesting habits and song as its scarlet-coated relative. Another interesting species is the *western tanager*, or *Louisiana tanager*, found in summer from the Rockies to the Pacific coast. The male of this group has black back, tail, and wings, crimson head, and yellow under parts. The tanagers are helpful in that they eat injurious insects, but the western tanager sometimes needs control, because of its fondness for cherries. D.L.

Scientific Names. The tanagers constitute the family *Tanagridae*. The scarlet tanager is *Piranga erythromelas*; the summer is *P. rubra*; the western is *P. ludoviciana*.

TANANA, *tah nah nah'*, RIVER. See ALASKA (Mineral Wealth).

TANANARIVO, *tah nah nah re' vo*, OR AN-TANANARIVO, *ahn tah nah nah re' vo*, the capital of Madagascar (which see).

TANCRED, *tang' kred* (about 1050-1112), prince of Antioch. With his cousin Bohemund he joined the First Crusade, swore allegiance to Alexius, the Greek emperor, and took an active part in the siege of Antioch. He soon joined himself to Godfrey of Lorraine, and in 1099 assisted in the capture of Bethlehem. During the siege of Jerusalem, he secured much booty and strengthened his power, shortly

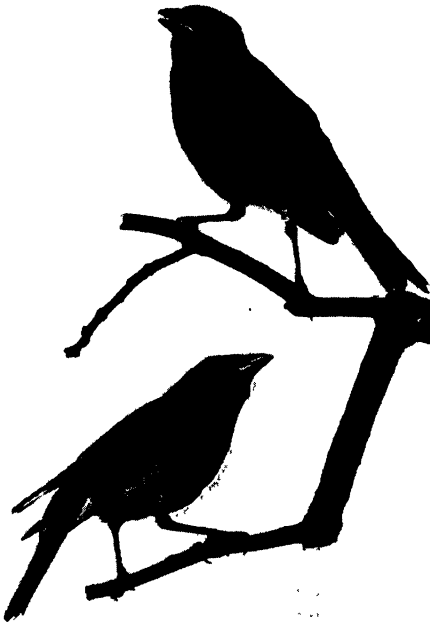


Photo: Visual Education Service

A PAIR OF SUMMER TANAGERS

the best-known is the *scarlet tanager*, which nests in the Eastern United States and as far north as New Brunswick. The male has bright-scarlet plumage, with velvety-black wings and tail, and the female is pale yellow below and

thereafter being made Prince of Galilee. Between the years 1100 and 1103, during Bohemund's captivity, he served as regent of Antioch. Two years later, Bohemund surrendered the government of Antioch to Tancred, who by this time had also secured possession of the government of Edessa. In 1107 he wrested Cilicia from the Greeks, and thereafter his attacks were directed persistently against Northern Syria. Tasso (which see) has immortalized the name of Tancred in his famous *Jerusalem Delivered*.

TANEY, *taw' nie*, ROGER BROOKE (1777-1864), one of the most noted Chief Justices of the United States Supreme Court, the jurist who gave the decision in the famous Dred Scott Case (see DRED SCOTT DECISION). This verdict was one of the

important factors in the anti-slavery struggle that helped to bring on the War of Secession. Taney was born in Calvert County, Md., and was educated at Dickinson College (Pennsylvania). After studying law in Annapolis, he was admitted to the Maryland bar in 1799, and a few years later established himself in Baltimore. In 1831 President Andrew Jackson appointed him Attorney-General, and relied upon him for advice and support.



Photo: Brown Bros.

ROGER B. TANEY

Jackson, who was opposed to the United States Bank, determined to weaken it by withdrawing the government deposits. He could accomplish this only through his Secretary of the Treasury, and, after deposing two such Cabinet members for not complying with his orders, Jackson, in 1833, appointed Taney Secretary of the Treasury. Then the government deposits were forthwith removed. However, this procedure brought censure upon Taney, and the Senate refused to approve his appointment. In 1836 Taney succeeded John Marshall as Chief Justice of the Supreme Court. His decisions revealed a stricter construction of the Constitution than was typical of those of his predecessors.

TANGANYIKA, *tahn gahn ye' kah*, the longest fresh-water lake in the world, and one of the deepest, is situated in the east-central part of Africa, 175 miles southwest of Victoria Nyanza. It is about 450 miles in length and but thirty to forty-five miles in width, and its area is about 12,700 square miles. It is one and a half times as large as Massachusetts. The waters of Lake Tanganyika reach the

Congo River by way of the Lukuga, which flows from it on the west, and the lake is fed by several small streams whose sources are in the surrounding mountains. Profuse growths



LOCATION MAP

The long, narrow lake is Tanganyika; above, to the northeast, Victoria Nyanza; below, one-half visible, Nyassa. The small corner map shows in the black area the part of the continent appearing in the larger map.

of tropical plants are found on its shores, and its waters abound in fish, crocodiles, and hippopotami.

Tanganyika was first viewed by Europeans in 1858, when the town of Ujiji, on its eastern shore, was visited by the Burton and Speke expedition. It was at this place, in 1871, that Dr. Livingstone was found by Stanley. The latter explored the whole lake in 1876. Great Britain, Germany, and Belgium established stations on its shores, and the Germans, early in 1914, completed a railroad (773 miles) extending across the district then known as German East Africa (now Tanganyika Territory), from Dar-es-Salaam, on the Indian Ocean, to Kigoma. Germany lost all its African possessions after the World War. Belgium, since the war, has completed a railway from the Upper Congo region to the lake. In 1919 Great Britain added a portion of the shore line to its mandate, Tanganyika Territory (which see), and Belgium extended its territory to the northeast to include the mandated Ruanda and Urundi.

TANGANYIKA TERRITORY, from 1884 to 1919 known as GERMAN EAST AFRICA, is situated in the east-central part of the continent. It has an area of 365,000 square miles (nearly one and one-half times that of Texas), and a population of about 4,130,000, of whom about 4,500 are Europeans. The natives are mostly Bantus (see BANTU).

German East Africa was conquered, during the later years of the World War, by a combined force of British and Belgian soldiers. The territory was placed under the control of Great Britain by mandate of the League of Nations, except about one-tenth of its area, which was annexed to Belgian Congo. Its affairs are administered by a governor, an executive council, and a legislative council, which was added in 1926. White settlers, because they are so few in number, are not yet given representation in the government. The gover-

nor is pledged to safeguard the laws and customs of the natives, unless they are opposed to justice or morality. Slavery was abolished in 1923.

Description and Resources. The coast, which is 620 miles long, is low and flat, but most of the interior is a table-land situated at an altitude of 3,000 to 4,000 feet. South and east of this table-land are several chains of mountains. In the northeastern corner of the colony rises the volcanic peak of Kilimanjaro, 19,321 feet in altitude, which is the highest point in Africa. The rivers are not navigable.

Agriculture and cattle-raising form the chief occupation of the inhabitants. Millet, wheat, sisal hemp, cotton, tobacco, copra, rice, coffee, tea, and sugar cane are grown. Rubber is collected in increasing quantities. These products, together with ivory, constitute the chief exports. Coal, iron, gold, lead, mica, tin, copper, and salt have been found, and since 1926 diamonds have been mined.

The capital and chief seaport is Dar-es-Salaam (population, 25,000); it is connected with Kigoma, on Lake Tanganyika, a distance of 773 miles, by a railway (the Central Railway) which traverses the colony from east to west. There is another railway, running from Tanga, on the coast, to Moshi, at the foot of Kilimanjaro, a distance of 220 miles. A line begun in 1924 from Tabora, on the Central Railway, was completed as far as Mwanza by 1928, a distance of 238 miles. Plans have also been made to connect Tanga, the important seaport on the north, with Dar-es-Salaam.

History. German colonization started here in 1884, and the boundaries of the colony were fixed by treaties concluded with England, Belgium, Portugal, and the sultan of Zanzibar, between 1884 and 1890. A serious uprising of the natives that took place in 1905 was soon crushed, but it had the effect of making the German authorities improve their treatment of the natives. During the World War, English and French troops invaded the colony and fought several engagements with the German forces, but without any decisive results. In the early part of 1916, the English and Belgians started a strong offensive, capturing the colony late in 1917. See map of Africa.

TANGERINE, *tan jur een'*, a variety of orange named for Tangier, Morocco. It is said to have been derived in America from the mandarin orange (see ORANGE). The tangerine is somewhat flattened, and is of a deeper color than the common orange. The peel is easily separated from the pulp, which is sweet and juicy. Although they are smaller than the common orange, tangerines are highly prized by many, on account of their flavor. They are raised in most of the Gulf states. Their scientific name is *Citrus nobilis*, var. *deliciosa*. B.M.D.

TANGIER, *tan jeer'*, a picturesque old town of Morocco, of which it is the principal seaport. There is a record which states that, in the year 788, Tangier was "the oldest and most beautiful city" of that part of the continent. Though a part of Morocco, it is not under Moroccan jurisdiction, for the city and surrounding territory (see MOROCCO) have been internationalized since 1923. The city is near the western entrance to the Strait of Gibraltar, about thirty-five miles southwest of the town of Gibraltar. From the sea, the town has the appearance of a great amphitheater, with white houses rising tier on tier; at the highest point, on a plateau to the north, is an old castle, a crumbling ruin. The tourist in Tangier is reminded of an ancient civilization at every turn of the narrow, winding streets, some of which are too steep to permit travel by vehicles. There are few manufactures, but the city is the center of the export trade of the country. However, considering its strategic position for trade, Tangier has suffered a decline which the international administration has not succeeded in alleviating; unfortunately, red tape and the jealousies of the rival powers have had a deterrent effect on the city's development. In 1928 the Franco-Spanish railroad, extending from Tangier to Fez, was opened, and harbor improvements are under way.

The executive control of the town and zone is entrusted to an administrator and assistant administrators; the legislative power is vested in an international assembly of twenty-six members; their decisions are subject to the vote of a committee of control whose members are the consuls of the powers signatory to the Algeciras Act (France, Belgium, Spain, Great Britain, Italy, the Netherlands, Portugal, Russia, Sweden, the United States, and Morocco). A *mendoub*, a Moorish official, represents the sultan. Population, about 56,000; 11,000 are Europeans, 12,000 are Jews (who largely control trade), and 33,000 are Moors.

TANKS. See WORLD WAR; TRACTION ENGINE.

TANNHÄUSER, *tahn' hoi zur*. See OPERA (Some of the Famous Operas).

TANNIN, OR **TANNIC ACID**. In a specific sense, these names are applied to an acid found in large quantities in gallnuts, produced on plants by the larvae of insects (see GALLS). It is a compound of carbon, hydrogen, and oxygen, and is an almost colorless, odorless powder, soluble in water and alcohol, and having a bitter, puckery taste. Considered in a general way, the tannins are a group of vegetable compounds widely distributed in plants, especially oak, acacia, quebracho, eucalyptus, hemlock, sumac, valonia, mangrove, and chestnut. Tannins of commercial importance find wide use in the tanning industry, as mordants in calico-printing and dyeing, in ink manufacture,

TANNING



A MODERN BELGIAN TAPESTRY

Presented to the Crown Prince and Crown Princess of Belgium, Leopold and Astrid, on the occasion of their marriage in 1926. It was the work of a Belgian woman, Mlle. Dubois, a famous weaver. She spent thirteen years in its making. The tapestry was bought for the royal couple with money raised by popular subscription.

and as astringents in medicine. See **TANNING**;
FIRST AID TO THE INJURED. T.B.J.

TANNING. See **LEATHER**; **TANNIN.**

TANSY, an herb of the composite family, whose leaves and flowers have a bitter taste and a powerful aromatic odor. At one time, young tansy leaves were used by the housewife as a flavoring for omelets, pastry, and other foods, but this custom is no longer common. Oil of tansy, yielded by the leaves, is poisonous, but is used in medicines to a limited extent. The plant grows commonly along roadsides, and is also cultivated in gardens. It bears dark-green, feather-like leaves, and flat-topped, yellow flowers, which appear at the top of the stem. Tansy is a native of Europe, and was introduced into North America, probably as a medicinal plant. Herb doctors formerly prescribed tansy tea for colds. The *yarrow*, a weed belonging to the same family, is sometimes wrongly called tansy. B.M.D.

Scientific Name. Tansy belongs to the family *Compositae*. Its botanical name is *Tanacetum vulgare*.

TANTA, EGYPT. See **EGYPT** (Modern Cities).

TANTALUM. See **CHEMISTRY** (The Elements).

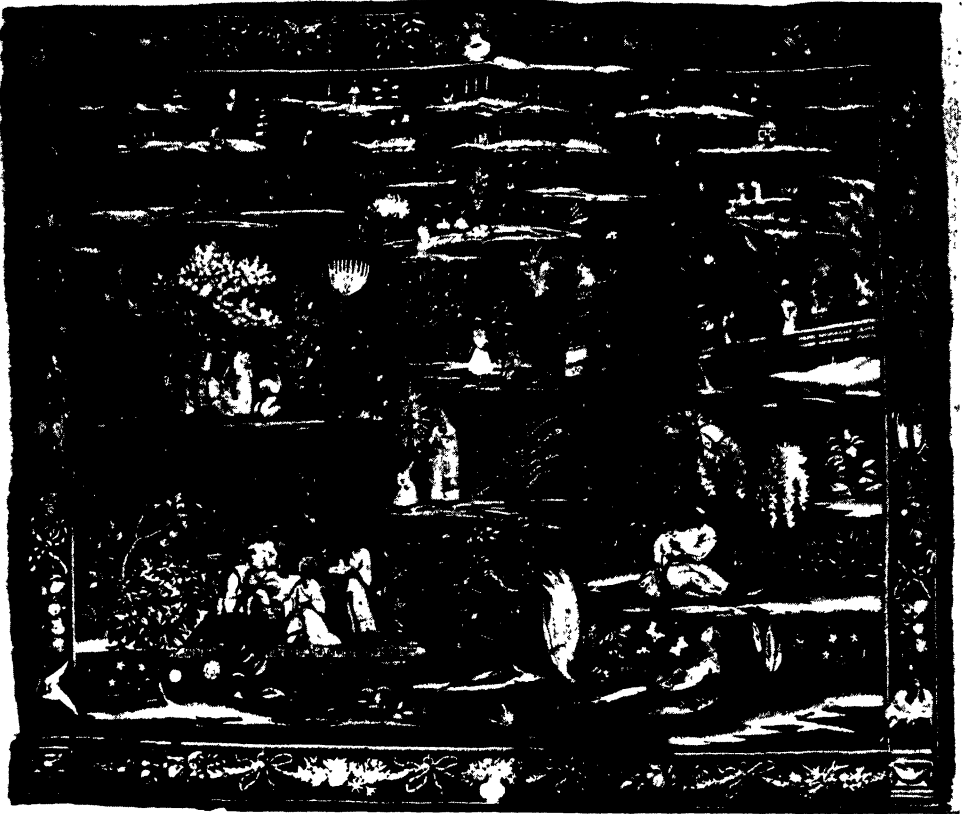
TANTALUS, in mythology, a Grecian king who was said to be the son of Jupiter and the father of Pelops and Niobe. According to the legend, he killed his son Pelops and served him as a dish to the gods, who in punishment condemned Tantalus to terrible sufferings in Hades. Plagued by an unquenchable thirst, he was made to stand immersed to the chin in water, which always receded when he tried to drink; gnawed by never-ceasing hunger, he saw, hanging above him, fruit-laden branches which always swung away when he tried to reach them. From this legend the word *tantalize* is derived. See **NIOBE**; **PELOPS**

TAOISM, *tau' iz'm*, a philosophical system originated in China in the sixth century B.C., by a sage known as Lao-tse. He was a contemporary of Confucius, and these two great thinkers are known to have taken counsel together. At the present time, the Chinese venerate the name of Lao-tse almost as much as that of Confucius, and Taoism holds an important place among the Chinese religions. It is, however, a debased and degenerate form of religion, with no suggestion of the lofty ideals of its founder. The priests of Taoism claim to have magic powers, and the ritual is a combination of witchcraft and demonology. The principles laid down by Lao-tse are difficult to explain, but he seems to have attempted to point out a way to right conduct and true happiness. Simplicity was his keynote, selfishness was not to be tolerated, and frugality was a necessary virtue. His precept that one should have the ability to find contentment, regardless of poverty and privations, developed characteristics found to this day among the Chinese.

TAOS, tah' ohs, MOUNT. See **NEW MEXICO** (The Land).

TAPAJOS, tah pah' yohzh, RIVER, one of the principal branches of the Amazon River. It rises in the southern part of Brazil, midway between its eastern and western boundaries, and flows in a northwesterly, then in a northeasterly, direction, discharging into the Amazon near Santarum, after a course of about 1,200 miles. Its basin lies between those of the Madeira and the Xingu rivers. The Tapajos is navigable by small vessels throughout almost its entire length, although in the upper course there are falls and rapids.

TAPESTRY, an ornamental fabric used for decorating the walls of churches and palaces, and as a covering for windows, archways, furniture, and floors. Tapestries are made by a special process of weaving, described by an



"THE TOILET OF THE PRINCESS"

Photo: Wide World

A tapestry once the property of Elihu Yale (see YALE UNIVERSITY, subhead), presented to the university in 1926. It dates from about the year 1700.

authority on the subject (Charles M. Froulke) as follows:

Tapestries are made by interweaving variously colored wool threads with undyed warp threads, after the warp threads have been stretched upon a loom, either vertically or horizontally. This interweaving is done with an implement called a *broché* in French, which is neither a shuttle nor a bobbin, but partakes of the character of both, and for which there is no equivalent word in English. The picture represented is developed upon the warp by the different colors of the wool threads. Needles are never used in weaving tapestries. In the process of weaving, the wool becomes practically an integral portion of the completed structure.

Tapestry-making, which dates from antiquity, reached its artistic heights in the fifteenth century. The industry was then centered in Flanders at Arras (now a city of France), and so excellent were the tapestries made there that the name of the city was applied to the fabric itself. In Shakespeare's *Hamlet*, to cite a familiar instance, Hamlet kills Polonius by driving his dagger through the arras behind which the eavesdropper is hidden. Antwerp, Brussels,

Bruges, Lille, and Valenciennes also developed as important centers of tapestry-making, and the art became nationalized in both France and Flanders.

In Paris, early in the seventeenth century, a factory under royal patronage was established in the dye works of the Gobelin family, and in 1662 the property was transferred to the control of the state. Gobelin tapestries became world famous, and the present museum connected with the establishment is one of two in the world in which tapestries and textile fabrics alone are exhibited. The other is in Florence. In the Gobelin museum may be seen tapestry reproductions of many of the great masterpieces of painting. In 1924 a Gobelin tapestry, valued at \$50,000, picturing the departure of American troops for the World War, was presented to the Philadelphia Art Museum by the French government.

There are also valuable state collections of tapestries in Madrid and Vienna, and throughout the European continent; in all parts of the civilized world there are countless beautiful

fabrics preserved in mansions, castles, cathedrals, and museums. These tapestries picture historical events, scenes from legend and mythology, Biblical episodes and personages, flowers, conventional designs, heraldic devices, coats of arms, etc. Among the famous specimens of this art is a series illustrating scenes in the life of the Apostles, copied from cartoons made by Raphael, and now in the Vatican. The celebrated Bayeux Tapestry in Bayeux, Normandy, is really an example of embroidery (see below).

Bayeux, bah yuh', Tapestry, the most remarkable and costly embroidery remaining from early medieval times, picturing, in a series of scenes, the life of Harold and the invasion and conquest of England by William the Conqueror. Tradition asserts that it is the work of the latter's wife, Matilda, and that it was made for Odo, bishop of Bayeux, as a decorative hanging for his cathedral, where it was found. It is 230 feet long and about twenty inches high, and contains 1,512 figures and inscriptions in Latin, worked in red, green, blue, and yellow wool, on a white canvas foundation. Authorities do not hesitate to consult it for details as to the manners and costumes of the time which it represents. The tapestry has been preserved in good condition, and is still kept in the library in the town of Bayeux.

[Bayeux is a very old town, and its life centers about its fine cathedral, said to be the most ancient in Normandy. It is in the Aure Valley, about five miles from the English Channel, and has a thriving agricultural trade, besides manufactures of porcelain, lace, and calico. Population, 1926, 6,500.]

TAPEWORM, an animal parasite that lives in the intestines of human beings and lower animals. It consists of a very small head and many body segments, and may vary in length from a few inches to ten yards. The parasite grows by the formation of new segments, or buds, which develop behind the head and are continually pushed backward as others form. The tail segment is therefore the oldest. The head has a ring of four sucking discs, by means of which the animal attaches itself to the mucous membrane of the intestine. It obtains food by absorbing nourishment through its skin; the body floats freely, and can take in nutriment from all sides. There are no digestive organs, and there is no mouth. Fertilization of eggs occurs in each division of the worm, and when the embryos reach a certain period of development, some of the end sections separate from the others and pass out of the vic-

tim's body. It is the appearance of these pieces of worm that proves the existence of the parasite in the intestine.

There may be no symptoms of tapeworm. The presence of tapeworm may be discovered through finding portions of the worm in the stool. Among occasional symptoms of some value are unusual or irregular appetite, anaemia, weakness, and, rarely, convulsions. The presence of a tapeworm being suspected, saliva fumigatives should be taken, and the stools should be saved and examined for worm segments or eggs. The remedies used for tapeworm are extract of male fern or pomegranate, but these remedies are too dangerous to take, except under a physician's observation. After a dose of tapeworm medicine has been taken, the stools should be carefully examined for the worm, and especially for the head. The head, a tiny, blackish object, must be secured, or the worm will grow again. Tapeworms enter the body through the eating of poorly cooked pork or beef, or of fish infested with the larvae. See PARASITIC DISEASES.

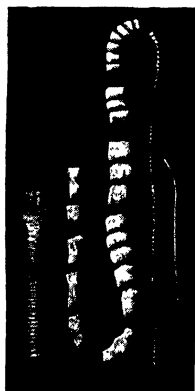
W.A.E.

TAPIOCA, a food starch widely used in the preparation of puddings. It is obtained from the root of cassava, a tropical plant belonging to the same family as the milkweed (see CASSAVA). There are two forms of root, the sweet and the bitter. The tapioca of commerce is extracted from bitter cassava, and comes chiefly from Brazil and the Straits Settlements. The roots are first washed, then cut, ground, and reduced to a pulp, after which the mass is strained until all the starchy particles are separated from the fibers. The moist, starchy mass is then placed on hot iron plates, and in the process of drying, the starch grains form the small, irregular, translucent balls known in the market as *pearl tapioca*. Another, finer form, called *minute tapioca*, is also marketed. This does not need the preliminary soaking required by pearl tapioca, before cooking.

The pudding made from tapioca is nutritious and easily digested. It is often served with sugar and cream or with a cream sauce. Apple or peach tapioca pudding, covered with a frosting made of white of egg and sugar, or served with cream sauce, is an attractive dish. Tapioca is rich in both starch and sugar, and has a fuel value of 1,650 calories per pound (see CALORIE). A flour made from cassava root is used as a thickening.

G.M.S.

TAPIR, ta' pur, an ungainly animal related to the horse and the rhinoceros. There are five living species, four of which are found in the western hemisphere. The chief characteristics of the tãpirs are a clumsily built body, short, stout legs, thick neck, and nose prolonged to form a movable trunk, or proboscis. They belong to the odd-toed mammals (see UNGULATES); the front feet have four toes and the back ones three. Tapirs are solitary, amiable



THE TAPEWORM

At the left is shown the head, considerably enlarged. The segments are parts of the worm. At the right are the head and head end of the worm, not greatly enlarged.

creatures, that live in the depths of the forests and frequent regions near water, in which they delight to plunge and bathe. They feed on shoots of trees, fruit, and other vegetable food,



which they draw into the mouth through the proboscis.

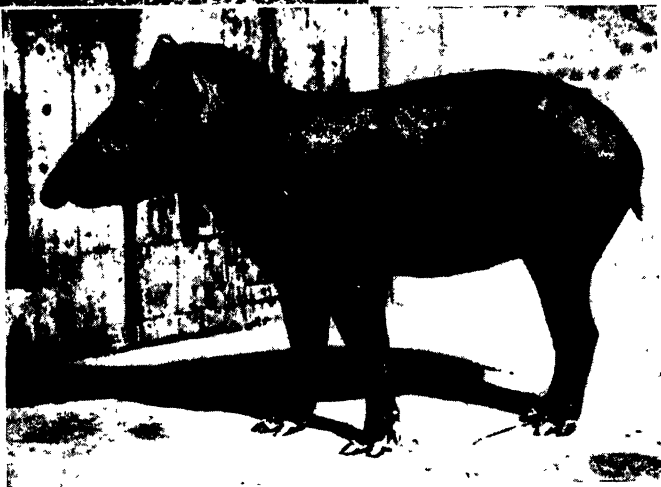
There are two species in South America, the most common of which inhabits the forest regions east of the Andes; the other dwells high up the slopes of these mountains. In Central America there are two species of hoglike tapirs, the smallest of the family. All of the American tapirs are of a uniform dark-brown color when grown, but the young are marked with fawn-colored stripes and spots. The Old World species is found in the Malayan region. It is larger than the American tapirs, being nearly four feet in height, and is very curiously marked, as its back, rump, and sides are white, and the rest of the body a glossy black, the two colors standing out prominently. The young, however, are marked like the young of the American species. Tapirs are hunted by the natives for their flesh and hides. W.N.H.

Scientific Names. Tapirs belong to the family *Tapiridae*. The species found east of the Andes is *Tapirus terrestris* (or *americanus*). The tapir of the Andean slopes is *T. roulini*. The Central American species form the subgenus *Tapirella*. The Malayan is *Tapirus indicus*.

TAPS, an army bugle call. See BUGLE.

TAR. When used without any qualifying word, this term refers to *wood tar*, the product of the special distillation of several kinds of wood, including pine, fir, and larch. *Coal tar*, a by-product obtained in the manufacture of illuminating gas from bituminous coal, is always referred to by that name (see COAL TAR).

Wood tar is a dark-colored, semi-fluid substance with a strong, pungent odor. It is used for coating and preserving timber exposed to the weather, for calking seams in boats and sidewalks, and in the construction of roofs. Medicinally, it is valued for its antiseptic qualities, and is used in the preparation of ointments and lotions for treating skin diseases. Tar is also an in-



Photos: Wide World

THE TAPIR AND THE HORSE HAD COMMON ANCESTORS

Above, a saddleback tapir from the Dutch East Indies, in the New York Zoological Park. Below, a Brazilian tapir, photographed in the London zoo.

redient of various cough mixtures, especially that yielded by pine wood. There are two methods for producing tar—stacking and slow firing, and distillation in retorts or ovens. The latter is the more economical and up-to-date, and it makes possible the isolation of valuable by-products. Among these is wood pitch, which is employed in the manufacture of varnish and artificial asphalts. Another is creosote (which see).

The stacking method, though crude and wasteful, is still practiced in the rural districts of North and South Carolina, Georgia, and

Alabama. Long-leaf pine is extensively used in these localities. Sticks of green wood are heaped to form a conical stack, the whole is covered with damp earth and sand, and the wood is permitted to burn slowly for several days. As the tar is melted out of the wood, it is collected in a large pan at the bottom of the stack, then conveyed through a pipe into a barrel. G.M.S.

TARANTELLA, a national folk dance of Italy. See DANCING.

TARANTISM, *tair'-an tiz'm*. See TARANTULA.

TARANTO, *tah'-rah'n toh*. See ITALY (The Cities).

TARANTULA, *tah-ran' tu lah*, a large spider named for Taranto, a city of Southern Italy, where it was first closely observed. It is still found there in great numbers. Formerly, its bite was supposed to cause *tarantism*, a peculiar dancing disease. The name, first applied in Europe, is now commonly given to any of the large, hairy spiders abundant in the Southwestern United States and in Central America, from which they are occasionally transported to temperate climes in cargoes of fruit. Tarantulas catch their prey, not in a web, as do many spiders, but by means of the sense of touch. Their homes are little wells in the ground, lined and covered with silky webs. Although their bite is painful, it is no more dangerous than that of other spiders, and, so far as known, is never fatal. S.H.S.

Scientific Names. The tarantula of Italy is classed as *Tarantula fasciventris*, of the family *Lycosidae*. The American spiders of that name belong to the family *Theraphosidae*.

TARBELL, IDA MINERVA (1857-), an American writer famed for her sociological and historical investigations, was born in Erie

County, Pa. She was graduated from Allegheny College, and from 1883 to 1891 was associate editor of *The Chautauquan*. After studying for three years at the Sorbonne and the Collège de France, in Paris, she became, in 1894, associate editor of *McClure's Magazine*, a position which she held until 1906. In that year she accepted a similar position with the *American Magazine*, continuing in that post until 1915.

Writings. Besides a *Life of Abraham Lincoln*, *Life of Madame Roland*, *Short Life of Napoleon Bonaparte*, and *The Tariff in Our Times*, she wrote other biographical and historical sketches, numerous articles for magazines, and the book for which she is best known, *History of the Standard Oil Company*. This last-named work, by opening the eyes of the people to the power and the methods of great corporations, had a very real effect on business in the United States. Other and later volumes are *The Business of Being a Woman*, *The Rising of the Tide*, *In the Footsteps of the Lincolns*, *Life of Judge Gary*, and *A Reporter for Lincoln*.

TARE, a name applied to various species of vetch, but most often to *common*, or *spring*, *vetch*. The plant mentioned in the parable of the tares and wheat, found in *Matthew XIII*, 24-30, was probably darnel. See VETCH.

TARGET. See ARCHERY, subhead.

TARGUM, *tahr' gum*, a paraphrase of the Old Testament, in Aramaic, the language used by the Jews after the Exile. The version was made for use in the synagogue worship. At first the Targums were merely spoken explanations of the Hebrew text, but they gradually took on a fixed form and were reduced to writing. There are extant three Targums on the Pentateuch, one on the Prophets, and Targums on *Psalms*, *Job*, *Proverbs*, *Song of Songs*, *Ruth*, *Lamentations*, *Esther*, *Ecclesiastes*, and *Chronicles*. See ARAMAIC.

TAR-HEEL STATE, a popular name applied to North Carolina (which see).



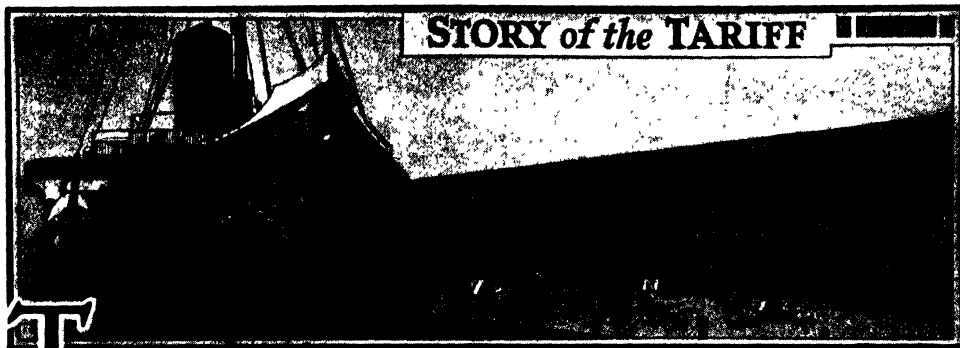
THE TARANTULA

This one was dead before it was placed on the hand to be photographed. The size of this ugly spider can be judged from the illustration.



Photo: U & U

IDA M. TARBELL



TARIFF, *tair' if*, a list or schedule of duties levied on goods sent to or arriving from foreign lands. In its original meaning, a tariff was not a tax or duty, but rather a list of articles on which duties were levied. However, for many years, the legal meaning of the word has included both the list and the rate, or duty. The word is derived from the Spanish *tarifa* and the French *tarif*, which mean a *price list* or *rate book*.

Tariffs are levied for three purposes: (1) as a means of obtaining revenue for a country; (2) as a means of keeping out certain foreign articles while a nation is developing its own manufactories for such goods; and (3) as a means of punishing or retaliating upon other nations for imposing high rates. This last form is seldom employed now, but its opposite, *reciprocity*, whereby one nation lowers its duties for another, if the latter returns the favor, is very common. A country which has a tariff for revenue only, without attempting to secure protection for its industries, is known as a free-trade nation. The only important nation which maintains free trade as a general policy is Great Britain. Free trade does not mean freedom from all tariff restrictions; Great Britain levies a revenue duty on tea, sugar, coffee, wines, and a few other articles which could not possibly be raised at home, and has found it advisable to adopt protectionist measures under stress of war conditions.

Early Tariffs. The custom of collecting such revenue is very ancient. The early Egyptians and Babylonians levied import duties at their ports and city gates, while the government of Athens laid a duty of two per cent on both incoming and outgoing merchandise. Moreover, a duty or tax was collected by the Athenians for the use of their harbor by foreign vessels. The Roman government, about the time of Christ, was demanding five per cent of the value of goods as a regular import duty, and under the later emperors, this was increased to twelve and one-half per cent. Between the years 800 and 1500, the tariff conditions in Europe were perplexing. Every petty feudal

lord claimed the right to collect a revenue on goods passing through his lands, and oftentimes a merchant going from one city to another was obliged to pay such a fee every ten or fifteen miles. Merchandise going overland from Rome to Germany or Holland sometimes paid in tolls many times its original price.

England. It is certain that duties were collected at the London ports as early as 980, and by 1380 these were so important that Chaucer, the first great English poet, considered himself honored when appointed to the post of supervisor of London customs. Under Edward I, who ruled from 1272 to 1307, special duties were levied on goods brought by foreign merchants, thus establishing the first tariff for protection in England. Such duties were called *poundage*, because they were based on weight. In the seventeenth century, the ruler acquired the further right of taking two tuns or barrels of wine from every twenty imported; this tax was called *tunnage*. All these taxes on imports were considered temporary, and were frequently increased, decreased, or dropped; but toward the close of the seventeenth century, duties were made permanent, and were levied expressly for the purpose of paying the government debt.

Gradually, it became the custom to adjust the duty to the value, and not to the bulk or weight of an article, and from time to time, between 1545 and 1800, rate books were issued by the government, to show exactly what articles were thus taxed. The suffering of the British people, especially the Irish, because of a series of famines after 1840, convinced the members of Parliament that the islands could not produce enough cheap food for the inhabitants. The first great step toward free trade was the repeal of the Corn Laws, in 1846, followed by the abolition or reduction of more than a thousand duties. Great Britain became, therefore, a free-trade country. The British colonies failed to follow the mother country in advocating free trade; Australia, South Africa, and Canada have insisted upon protective rates for numerous commodities. India is the only

important British possession which has free trade.

Other Countries. Countries not so peculiarly situated have not been inclined to adopt free trade. In France, for instance, high tariff was the rule until 1790, not only at the entrance ports, but between each little province within the country. The internal tariff was abolished during that year, but, with such exceptions as arise from a few reciprocity treaties, France still imposes a high protective tariff on foreign goods. Germany had only moderate protective rates until 1902, when the duties on numerous agricultural and manufactured articles became almost prohibitive. Other European nations have followed the examples of France and Germany, and few civilized countries are now without high duties.

United States. From the earliest days of the American nation, peculiar circumstances seemed to favor the adoption of protective rates. The bitterness between Great Britain and the new country had caused both Englishmen and Americans to desire that each other's goods be kept out, and it was looked upon as an act of patriotism in an American to discourage the importation of foreign merchandise. The immense debts of the Revolution and the War of 1812 made necessary the gathering of every available penny of revenue, while the feeble and easily frightened industries of the new land needed every possible aid. In time, when these infant industries became strong, their very strength was used as an argument for the continuance of the policy that built them up.

The first national tariff law in the United States was that of 1789. Although the law states that one of its objects is the "encouragement and protection of manufacturers," the duties levied by it were so moderate that the protection granted was slight. This act was superseded by the tariff of 1816, a distinctly protective measure. The duties were not high—the average rate was about twenty per cent—but they were in several cases sufficient to demonstrate the possibilities of protection to home industry. In the next year, the internal-revenue tax, which had prevailed since the War of 1812, was abolished, and President Monroe, in a message to Congress, frankly recommended a tariff solely for protection. Efforts were made in Congress to secure such a law, but no important tariff act passed both Houses until 1824. This law, which raised the average duty materially, was based on the principle that such foreign-made goods as competed with domestic products should be excluded from the American market.

The tariff was rapidly becoming the most important political question. The loose constructionists, under the leadership of Henry Clay, were the expounders of the "American system," which included a high protective tariff.

The tariff of 1828, generally called the "tariff of abominations," laid almost prohibitive duties on woolen and cotton goods and a few other commodities. This act aroused great opposition in the South, which then exported each year to Great Britain about \$25,000,000 worth of tobacco, cotton, and rice, whereas the imports of manufactured goods from Great Britain amounted to \$15,000,000. The South feared that prohibitive duties would lead to retaliation by Great Britain and thus kill its export trade in raw materials. The South also declared that the Constitution gave Congress power to levy duties for revenue only, and not for protection. The protests against this act culminated in the nullification movement, led by John C. Calhoun. Congress modified the duties slightly in 1832; but still recognized the principle of protection.

As the tariff of 1832 was still unsatisfactory to the South, in 1833 a compromise was effected, whereby the duties would be gradually reduced until 1842, after which year there was to be a uniform duty of twenty per cent on all imports. In 1842, however, the Whigs passed a new law providing high duties. When the Democrats were returned to power, they promptly passed (1846) a new bill, the Walker Act, which was called a free-trade measure; it lowered some duties, but, in fact, it retained many of those which had been the subject of controversy in the preceding half century. In 1857 the duties were lowered again, this time without much opposition, because there was a growing surplus in the National Treasury.

The policy of decreasing the duties was abandoned at the outbreak of the War of Secession. The sentiment against protection had gradually increased after 1828, and, except for the period of 1842 to 1846, the duties had been slowly lowered. Without considering the possibility of war, Congress passed the Morrill Act of 1861, raising the average duty for the purpose of protection, and to secure revenue to meet increased expenses. During the next four years, not a session of Congress passed without some increases in duties. It was generally supposed that the duties would be drastically reduced, once the War of Secession was over, but, as a matter of fact, no marked reduction was made. The manufacturing industries of the country enjoyed a rapid growth; and there was a widespread feeling that protection was necessary and beneficial.

About 1880, however, the government's annual surplus began to increase, and Congress spent it wastefully. The demand for a real remedy, a lower tariff, led to the appointment of a Tariff Commission in 1882, to ascertain the effect of the existing tariff laws and to recommend changes in them. As the commission and Congress were both controlled by high protectionists, the resulting law of 1883 lowered but

few schedules; it was designed to give only such reductions as would silence the demands of the opposition. The tariff became one of the issues of the campaign of 1884, which resulted in the defeat of the Republicans and the election of Grover Cleveland, the first Democratic President since the War of Secession.

The Mills Bill of 1888, embodying the low-tariff ideas of President Cleveland and his party, was passed by the House, but failed to pass in the Senate, which the Republicans controlled. The Republicans, in their turn, interpreted the outcome of the campaign of 1888, which returned Harrison, a Republican President, as an endorsement of high tariff. The result was the McKinley Tariff Act of 1890, which raised the average level of duties to a higher point than ever before. A noteworthy feature of the act was the reciprocity clause, added through the influence of James G. Blaine, then Secretary of State. A month after this act was passed, the Democrats secured control of the House as the result of the November elections. In the ensuing Presidential campaign, the tariff was again the issue, and Cleveland's second election seemed to make a lower tariff inevitable. But because of the disturbed business conditions, following the panic of 1893, the controversy over the money question, and the narrow Democratic majority in the Senate, the high hopes entertained for a lower tariff were defeated. The Wilson Bill of 1894 made so few reductions that Cleveland showed his disapproval by allowing it to become a law without his signature (see CLEVELAND, GROVER).

The financial and economic crisis of 1894 to 1896 foreshadowed another change in the tariff. Although the campaign of 1896 was fought solely on the question of free silver, President McKinley called a special session of Congress to consider the tariff. In the resulting Dingley Tariff Act of 1897, protective duties reached a new maximum. During the Spanish-American War, a number of special duties, particularly one of ten cents a pound on tea, were levied for revenue purposes, but these were repealed in 1901 and 1902.

The industrial development of the United States since 1890 has been little short of marvelous. The Republicans, almost without exception, have attributed this growth to the protective tariff. The Democrats, with equal unanimity, have attributed it to the country's enormous natural resources, and have pointed to certain evils connected with industrial control, which they claim were caused by the tariff laws. The need of some readjustment of duties became clear about 1904, and after that date, both the great political parties declared themselves in favor of tariff revision. The Republicans, however, paid no attention to the tariff during Roosevelt's administration, and

when they did consider it, in the first year of Taft's administration, passed the Payne-Aldrich Law. There is still some dispute as to whether this act raised or lowered the level of the duties as levied under the Dingley tariffs. The changes were so numerous and so complex that nobody was quite sure what the effects of the law would be. The President defended the law as the best possible under the circumstances, but the public expressed its disapproval by returning a Democratic majority in the House of Representatives, a year later.

In 1913, immediately after his inauguration, President Wilson called a special session of Congress to enact a new tariff law. The new bill, known as the Simmons-Underwood Tariff Act, provided many changes in the rates. The duties on cotton and woolen goods were greatly lowered, and raw wool was placed on the free list. Sugar, until May 1, 1916, paid a reduced duty; thereafter, it was entered free.

In 1921 Congress passed an emergency tariff act. The chief object of the new schedule was to offer a greater measure of protection to American agriculture from foreign competition. This was followed in 1922 by the Fordney-McCumber Act, which raised duties somewhat over the previous rates. It also provided that the President, on the recommendation of the Tariff Commission, could raise or lower any rate, by not more than fifty per cent, in order to adapt the rates to changing conditions.

One of the greatest difficulties to be faced in the preparation of a tariff for the United States is the extent of the country's area and the variety of its industries. Thus, the clothing manufacturers of the East and Middle West want free wool, but the sheep-rancher in the Far West demands protection. The sugar-planter in the South wants a bounty or an import duty, to enable him to compete to better advantage with the planters in Cuba and the tropical regions, but the sugar-refiner and many other people ask for free sugar. Thus a general tariff act always involves compromise, usually characterized by the sacrificing of the interests of the people as a whole to the interests of certain sections and groups.

The Tariff and the Farmer. Shortly after his inauguration, in 1929, President Hoover called a special session of Congress to consider changes in the tariff with particular reference to the needs of agriculture. The new measure, which was introduced in the House by the Ways and Means Committee, and known as the Hawley-Smoot Bill, provided for substantial increases of the duties on many agricultural products. The most important of these were the rates on sugar, wool, beef, pork, wheat, corn, rice, and milk. The increases varied from ten to three hundred per cent. Changes were also proposed in the tariff for other industries, but, owing to the opposition of a coalition group in the Sen-

ate, consisting of insurgent Republicans and Democrats, many provisions of the Hawley-Smoot Bill were defeated. The special session merged into the regular session, and the debate continued for months.

The discussion which was occasioned by this proposed legislation brought the tariff into prominence as an important means of giving the farmer the benefits of protection, which have formerly been thought peculiarly applicable to industrial products. E.J.

Related Subjects. The following articles in these volumes will give further information on the subject of the tariff, and will make clear certain references in the foregoing discussion:

Democratic Party	Protection
Free Trade	Reciprocity
McKinley, William	Republican Party
Nullification	Tax and Taxes
Political Parties	United States

"TARIFF OF ABOMINATIONS." See TARIFF.

TARKINGTON, *tahr' king tun*, NEWTON BOOTH (1869-), an American novelist whose stories show a delightful blending of realism and idealism. He is one of the outstanding personalities of a brilliant group of contemporary Indiana writers. Tarkington was born in Indianapolis, educated at Phillips Exeter Academy and at Purdue and Princeton universities, and, aside from serving a term in the Indiana house of representatives, has devoted himself to writing since the appearance, in 1899, of his first novel, *The Gentlemen from Indiana*. This vivid picture of the struggles of a young journalist in a backward Indiana village established his reputation and revealed a talent that has been steadily developed.



BOOTH TARKINGTON

Representative Writings. *Monsieur Beaucaire*, a beautifully written romance of a French prince in disguise, appeared in 1900 as Tarkington's second novel. It is still popular; in dramatic form it was played successfully by Richard Mansfield, it had several seasons as an operetta, and was made into one of the most artistic moving pictures ever presented. Other novels followed in rapid succession, including *The Two Vanrevels*, *Cherry*, *The Conquest of Canaan*, the *Penrod* stories, *The Turmoil*, *Seventeen*, *The Magnificent Ambersons*, *Alice Adams*, *Gentle Julia*, *The Midlander*, *The Plutocrat*, *Claire Ambler*, and *Young Mrs. Greeley*. Among several plays, written wholly or in part by him, the most popular have been *The Man from Home*, *Mister Antonio*, *Clarence*, and *The Intimate Strangers*. Tarkington has also written some original moving-picture stories, and a number of his novels and plays have been suc-

cessfully adapted to the screen. In his dramatic work, he has collaborated with Harry Leon Wilson and Julian Street.

TARN, a name applied to a small Scottish lake. See the article SCOTLAND (Rivers and Lakes).

TARO, *tah' ro*, a Hawaiian plant known in the United States as *elephant's ear*, or *caladium*. From it the national dish called *poi* is made. See HAWAII (The People); COLOCASIA.

TARPEIAN, *tahr pe' yan*, **ROCK**, a steep rock forming part of the Capitoline Hill at Rome. According to tradition, it was named



THE TARPEIAN ROCK

As it appears in the twentieth century.

for Tarpeia, the daughter of the governor of the Roman citadel in the time of Romulus. Desiring greatly the golden bracelets worn by the Sabine enemies of Rome, Tarpeia treacherously opened to them the gate of the fortress, having first gained from the Sabines a promise that they would give her what they wore on their left arms. Once within the citadel, they cast their shields (which they wore on their left arm) upon her, and crushed her to death. She was buried at the foot of the rock, which ever afterward bore her name. In later periods of Roman history, those convicted of treason were ordinarily killed by being thrown from the Tarpeian Rock.

TARPON, a large game fish shaped somewhat like a salmon, found in West Indian waters and off the southern Atlantic coast of the United States. It grows to the length of nearly seven feet, and sometimes weighs 200 pounds. The flesh is coarse and not desirable for food, but the large, tough, silvery scales are used in decorative designs. Tarpon-fishing is one of the best American sports, for the fish is a skilful fighter and very strong. While most of the fishing is done off the South Atlantic coast, the range is not so restricted. Tarpon are found in the waters just south of Massachusetts in the early fall. These are of uniform size, and weigh from 80 to 100 pounds. L.H.

Scientific Name. The tarpon is known as *Tarpon atlanticus*.

TARQUINIUS, *tahr kwín' ih us*, LUCIUS, surnamed PRISCUS, the fifth legendary king of Rome, who reigned from 616 to 578 B.C. He was not of royal blood, but succeeded in gaining the throne on the death of Ancus Marcius, to whose sons he had been appointed guardian. His reign was one of the periods to which later Rome looked back longingly, in times of trouble or depression. He waged successful war against the Sabines and the Latin cities, made vassals of the powerful Etruscan cities (see ETRURIA), and began many great public works, among which were the *cloacae*, or sewers, the Circus Maximus, and the Temple of Jupiter, on the Capitoline Hill. It was he, according to some legends, who acquired the Sibylline books (see SIBYL), though other traditions connect them with Tarquinius Superbus. He was assassinated by the sons of Ancus Marcius.

TARQUINIUS, LUCIUS, surnamed SUPERBUS (THE PROUD), the last of the legendary kings of Rome, whose reign was from 534 to 510 B.C. He was the son of Tarquinius Priscus and the son-in-law of Servius Tullius, whom he had put to death to secure his own accession. He at once annulled all of the reforms of his predecessor, depriving the lower classes of their rights and catering to the patrician class. His tyranny induced general hatred, and the crime of his son, Sextus Tarquinius, against Lucretia precipitated a rising which drove Tarquinius from the throne and resulted in the founding of the Roman Republic. Several unsuccessful attempts were made to replace Tarquinius on the throne, the most famous of which was that of Lars Porsena, celebrated by Macaulay in his *Horatius at the Bridge*.

Related Subjects. The reader is referred in these volumes to the following articles:

Horatius	Rome (The Period of Legend)
Lucretia	Servius Tullius

TAR RIVER. See NORTH CAROLINA (Rivers and Lakes).

TARSAL BONES. See FOOT (in anatomy).

TARSUS, *tahr' sus*, the most important town in ancient Cilicia, in Asia Minor, and the birthplace of the Apostle Paul. Located in a fertile plain on the banks of the River Cydnus, twelve miles from the sea, Tarsus was a center of commerce from very early times. In the days of Paul, it was one of the "free cities" of the Roman Empire, and was renowned as a center of education and culture. Paul himself described it as "no mean city." Modern Tarsus, though it has a population of 73,680 (1927), is a backward and unattractive Turkish town, with no features of interest other than a few ruins of the Roman era.

TARSUS. See ANT (Parts of an Ant).

TARTAGLIA, *tahr tahl' yah*, NICHOLAS. See ALGEBRA.

TARTAN, *tahr' tan*, from the French *tire-laine* and the Spanish *tiritaña*, meaning a *thin woolen* or *silken cloth*, is the name of a worsted cloth checkered or crossbarred with threads of different colors. Tartan is historically associated with the costumes of the Highlanders of Scotland, and, according to tradition, each of the numerous clans had its own distinguishing tartan or plaid. Thus there was the tartan of Campbell of Argyll, light green crossed with dark green, with narrow, independent cross-lines of white; the Macdonald of Glengarry and Keppoch, red, with open, broad blue crosslines, and two independent blue crossings; the Macpherson, pale gray, four darker gray bars at crossings, the whole covered with red, double independent lines; and so on. The effect of a large number of these tartan costumes is suggested by Scott, in the *Lady of the Lake*:

Scarce to be known by curious eye
From the deep heather where they lie,
So well was match'd the tartan screen
With heath-bell dark and brackens green.

Tartan is not at the present time restricted to Scotland, but is worn to considerable extent in various countries. Numerous patterns are put out by manufacturers, and woolen, silk, and mixed goods are used as materials.

TARTAR, or ARGOL, a substance deposited as a hard crust on the sides of casks during the fermentation of grape juice. Chemically, it is known as impure acid potassium tartrate. Tartar varies in color from brownish-white to dark red, according to the color of the wine. It is important commercially as the source of cream of tartar (see CREAM OF TARTAR, for methods of preparation). The tartar that is formed on the teeth is a hard mixture of phosphate and lime deposited from the saliva. See TEETH.

T.B.J.

TARTAR EMETIC, *e mel' ik*, a medicinal preparation used in small doses as an emetic, or to increase the secretion and hasten the expulsion of mucus in respiratory diseases. In large doses, it is a violent, irritant poison. Tartar emetic acts on the stomach and intestines, and exerts a depressing effect on the heart and nervous system, and is now only sparingly used. It should never be taken unless prescribed by a competent physician. It is prepared by making a paste of water, antimony oxide, and acid potassium tartrate, boiling the mixture with water, and letting the solution crystallize.

TARTARIC ACID, a vegetable acid occurring as the potassium salt in many plants and unripe fruits, but especially in grapes. It is obtained commercially by treating the tartar deposited in wine casks (see TARTAR) with

lime and sulphuric acid. The ordinary product occurs in the form of large, clear crystals easily dissolved in water, the solution effervescing and having a refreshing, sour taste. It is used in the manufacture of dyestuffs and baking powders, in dyeing and calico-printing, in photography, and as one ingredient of Seidlitz powders (which see). See, also, TARTAR EMETIC.

T.B.J.

Chemical Formula. The formula for tartaric acid is $C_4H_6O_6$; that is, a molecule contains four atoms of carbon, six of hydrogen, and six of oxygen.

TARTARS, OR TATARS, *tah' tahrz*, originally the name of the Mongolic races of Central Asia who lived in Northeastern Gobi in the fifth century, and, driven southward by the Khitans four hundred years later, founded the Mongol empire. To-day, the term is used to designate many peoples, principally of Turkish origin, living in Western Asia and European Russia. See MONGOLS.

The western invasion of the Mongols in the thirteenth century gathered many Turkish stocks, as it approached the Ural and Altai mountains and the plains of Eastern Russia; and farther west they intermingled with Finnish and other ancient tribes, until the Mongol element became very weak and the Turkish more predominant. There are innumerable groups living in European Russia and Siberia which are given the name Tatars, or Tartars, and though their characteristics and original stocks vary with their geographic location, they are for the most part Mohammedan, and speak a Turkish language or dialect. Some are nomads, who gain a living by cattle-breeding and fishing, and others are agriculturists and gardeners.

Tatar took the form *Tartar* at an early date, by association with *Tartarus*, the Hades of classic mythology. The tribes bearing the name were greatly feared, because of the atrocities they committed. The word *Tartar*, however, is not correct from the standpoint of etymology.

Tatar is a Tungusic or Manchu word, meaning *archer* or *nomad*.

TARTARUS, *tahr' tahr us*, in early Greek mythology, a dark abyss surrounded by the fiery river Phlegethon, where Jupiter imprisoned the rebelling Titans (which see). Tartarus was later considered the place of punishment for all spirits of the wicked, and the name was used interchangeably with Hades, although Homer locates it as far below Hades as earth is below heaven. Aeneas, in his adventures in the abode of shades, came to a point where the road divides, the right branch leading to Elysium and the left to Tartarus.

In Literature. In Vergil's *Aeneid* occur these lines: There rolls swift Phlegethon, with thund'ring sound, His broken rocks, and whirls his surges round.

On mighty columns rais'd sublime are hung
The massy gates, impenetrably strong.

TARTARY, a name applied in the Middle Ages to that part of Eurasia inhabited by the Tartars (or Tatars). It included Manchuria, Mongolia, Turkestan, and the southern part of European and Asiatic Russia. The Tartars (which see) were fierce and warlike, and had the reputation of being very cruel in war. The modern expression, "to catch a Tartar," means to find a resourceful opponent in one considered easy to overcome, either in combat or in a test of mental powers. There is also an expression, "Scratch a Russian and you find a Tartar," meaning that, beneath the veneer of Russian civilization, lies the ferocity of a Tartar. This, however, does not apply to the Russians as a whole.

TASHKEND, *tahsh' kend*. See UZBEK.

TASMAN, *tahs' mahn*, ABEL J. See AUSTRALIA (History: Exploration and Colonization); TASMANIA.

TASMANIA, *taz ma' nih ah*, formerly called VAN DIEMEN'S LAND, is a state in the Commonwealth of Australia. It consists of one large and several small islands, separated from the



Photo: Australian Government

KING RIVER

A rushing torrent descending from the picturesque central highlands.

southeastern part of the mainland by Bass Strait, 140 miles wide. The island of Tasmania is of triangular shape, 180 miles from north to south, and 190 miles from east to west.



Photo: Australian Government

HOBART AND MOUNT WELLINGTON

The area of the entire state is 26,215 square miles, or about that of Virginia and Delaware combined. The population of about 215,860 (1928) is chiefly Australian-born. The aborigines of Tasmania are extinct. In religious affiliations, the people are mostly Anglicans, Roman Catholics, Methodists, and Presbyterians. Elementary education is free, and compulsory between the ages of seven and fourteen. Instruction extends from primary classes to the University of Tasmania, established in 1890.

Physical Features. The coast is remarkable for its bold headlands and picturesque inlets. The interior of the island forms a plateau with an elevation of between 3,000 and 5,000 feet above the sea level; this plateau contains many lakes. The mountain ranges bordering the central plateau do not reach a very great altitude, the highest point being Mount Cradle, which is 5,069 feet above sea level.

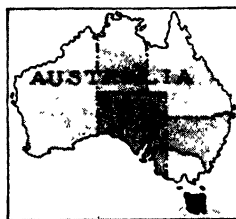
The geological formation of Tasmania is intimately connected with that of Victoria, on the main Australian continent, to which it was joined until after the Miocene Period.

The plant life resembles that of the continent as a whole, as also does the animal life, except for the absence of the dingo, or wild dog of Australia. Tasmania has two carnivorous animals which are peculiar to that country: the Tasmanian zebra wolf and the untamable Tasmanian devil, resembling a small bear.

The climate, though quite variable, is really delightful, and more healthful than that of any other of the Australian states. The heat is not usually excessive, though, during exceptionally hot periods, the thermometer has been known to rise as high as 100° F.; it seldom drops below 47° F. The island is well watered, possessing rivers which flow into the sea on every side.

Industries and Transportation. The soil is very fertile, and agriculture forms one of the chief occupations of the inhabitants. Oats are the chief crop. Hops, wheat, peas, hay, and potatoes are also grown. Fruit is extensively cultivated for jams and jellies.

The pastoral lands support great numbers of sheep and cattle, but the "meat" cattle are being supplanted by dairy herds. The forests yield great logs of eucalyptus. Mining, however, is the source of the principal wealth of the state. Copper, gold, silver, tin, lead, zinc, shale, and coal are produced, the combined value of the mine production exceeding that of crops. There are vast iron reserves, though the ores are little worked.



LOCATION MAP

The island lies south of Victoria, a state of the Commonwealth.

Tasmania has many desirable features for manufacturing, including a cool climate, natural resources, and water power. The state owns and controls the water power and sells it direct to the consumers, and developments are under way constantly to increase the supply. The principal industries are mining, the operation of metallurgical plants, saw-milling, the production of jams and preserves, dairy products, bricks, tiles, and pottery, and tanning. Smaller, but rapidly becoming more important, are the chemical, carbide, and electrode industries, especially those connected with zinc; furniture manufacture; and the making of farm implements.

The total length of the railroad system in Tasmania amounts to about 800 miles. More than three-fourths of the mileage is owned by the state. Macadamized roads, kept in good repair, run throughout the island.

Government and History. The government of Tasmania is similar to that of each of the other Australian states. The chief executive is a governor, and lawmaking is entrusted to a legislative council of eighteen members, chosen for six years, and a house of assembly, whose thirty members are chosen for three years.

Tasmania sends six Senators and five Representatives to the Federal Parliament of Australia. Members of the legislative council are elected by proportional representation, and the electorate is restricted by certain property, military, and occupational qualifications; all adults twenty-one years of age, who have resided in the state for six months, may vote for members to the house of assembly. The franchise was extended to women in 1903.

Van Diemen's Land, as Tasmania was first named, was discovered by Abel J. Tasman, the Dutch navigator, in 1642, and named after his patron Van Diemen, governor of the Dutch East Indies. It was first settled in 1803 by a party of convicts from Great Britain, and for fifty years received convicts from all parts of the British Isles. When the convict-settlement system was abolished in New South Wales, in 1840, demands for similar reforms and a responsible government arose in Van Diemen's Land. In 1853 this was partly accomplished, and the name of the island state was changed to Tasmania; however, responsible government did not come until three

years later. The gold discovered in Victoria in the fifties had a beneficial effect, and, having recovered from its early unfortunate history, Tasmania is now a thriving state.

Hobart, prior to 1881 called **HOBART TOWN**, is the capital of Tasmania. The city is beautifully situated on a bay of the Derwent River, twelve miles from its mouth. The harbor is deep and well sheltered, and accommodates the largest vessels. From Hobart.

Roald Amundsen sailed due south on his voyage that resulted in the discovery of the South Pole; and from that city was flashed to all the world the news of his achievement.

Hobart is a flourishing city situated in the midst of the fruit-growing district of Tasmania. It is the seat of the state university. On account of its invigorating climate, Hobart is a popular resort, and

an annual regatta held on the Derwent attracts visitors from all parts of Australia. Population, including suburbs spread out along the banks of the river, 52,600 (1928).

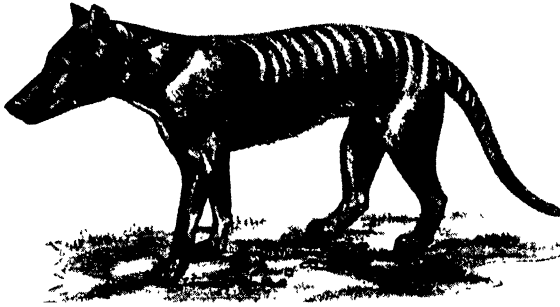
Related Subjects. The reader is referred in these volumes to the following articles:

Australia
British Empire, and British
Commonwealth of Nations

Dingo
Tasmanian Devil
Tasmanian Wolf

TASMANIAN DEVIL, a carnivorous animal peculiar to Tasmania and noted for its ferocity. It is a burrowing marsupial, with coarse black hair. Though only about the size of the common badger, it sometimes destroys sheep. Its scientific name is *Sarcophilus ursinus*, showing its relationship to the bear family (see BEAR).

TASMANIAN WOLF, **THE**, also called **ZEBRA WOLF**, **THYLACINE**, and **POUCHED DOG**, is a pouched animal that resembles a wolf or wild dog in appearance. It is a native of Tasmania, an island state of the Australian Commonwealth. The Tasmanian wolf is usually about forty inches long, but sometimes attains a greater size. The short fur is grayish-brown, and there are black stripes across the back, much like those of a zebra. The nose is long and sharp, and the tail is tapering. These animals were common in Tasmania in early days, but the European settlers succeeded in driving them into the mountains, after great depredations had been committed in sheepfolds and poultry yards. They hide in burrows or gulches in the daytime, making nightly raids for food. They differ from some of the other marsupials in that the marsupium, or brood pouch, opens backward. See **MARSUPIALS**. L.H.



THE TASMANIAN WOLF

The lines on the back and sides are not ribs showing through a gaunt body; they are black stripes, resembling those of a zebra.

Scientific Name. The Tasmanian wolf belongs to the family *Dasyuridae*. Its scientific name is *Thylacinus cynocephalus*.

TASSAGO, *tah sah' go*. See PEMMICAN.

TASSO, *tas' o*, TORQUATO (1544-1595), one of the greatest of the Italian poets, was born at Sorrento. His father, a fifteenth-century poet, took him to Rome at the age of ten, and there gave him careful training in literature and history. At that time he showed evidence of a remarkable memory and could recite long portions from Greek and Latin works. He was sent, at the age of sixteen, to the University of Padua, Italy, to study law, but within a year produced a romantic poem in twelve cantos, entitled *Rinaldo*. This remarkable work, dealing with the legends of Charlemagne, greatly surprised and gratified the Italian reading public. Although the father wished his son to confine his energies to law, which he believed to be more profitable than literature, he permitted Torquato to study philosophy and poetry. On an invitation of the authorities of the University of Bologna, the youth went to that institution, but in 1564 he had to leave the school, because he was unjustly accused of writing certain bitter satires against the professors. He then returned to the University of Padua, where his admiration for Vergil's poetry became so intense that he determined to write an epic along the lines of the *Iliad*.

At this time the Turks were harassing the Hungarians and the Italians, and the popular talk of another crusade against those invaders suggested to Tasso the idea of basing his creation upon the adventures of Godfrey de Bouillon in a crusade to Jerusalem. Thus began the famous *Jerusalem Delivered*, which, after Dante's *Divine Comedy*, is given rank as one of the greatest epics in the Italian language. While he was engaged in planning and writing portions of this long work, he found a patron in Cardinal d'Este, who took him to one of the centers of Italian culture, the court of Ferrara. There, amidst magnificent surroundings, noted men, beautiful women, and his own love affairs, he gained a multitude of experiences which he afterward included in his heroic poem. A quarrel with his patron sent him forth penniless in 1571, but Duke Alfonso of Ferrara sheltered him, and, under the patronage of this nobleman, he produced in 1573 the *Aminta*, possibly the most beautiful of all Italian pastoral plays.



Photo: Brown Bros.

TASSO

In April, 1575, Tasso announced that his *Jerusalem Delivered* was finished, but before publishing it he desired its examination by a body of churchmen, lest the charge of heresy or infidelity be brought against him. The churchmen demanded that all mythology and chivalrous adventures be omitted, and persecuted him with their criticisms. A blow on the head during a quarrel added to his mental discomfort, and in 1576 he showed signs of insanity. He had an idea that he was constantly being watched, and in June, 1577, while in the home of the Duchess of Urbino, drew a knife on a servant whom he considered a spy. He was taken to a country home, but escaped and wandered from town to town. In February, 1579, he returned to the court of Ferrara, and burst into the royal rooms with such signs of rage that he was confined as a madman. At length he was allowed to go to Naples, where he composed his *Jerusalem Conquered*, really a revision of the other epic, with most of the chivalry omitted.

In 1594 Tasso was ordered to Rome by Pope Clement VIII to be crowned for his poetry, but in the midst of the preparations, he became ill; within a few months, he died in the Convent of Santo Onofrio, near the city. The pathetic story of his life has furnished a theme to such writers as Goethe, Lamartine, and Byron. *Rinaldo*, the *Aminta*, a tragedy entitled *Torrismondo*, and *Jerusalem Delivered* are among the greatest of Italian writings, while the last-mentioned poem is classed as one of the world's noblest epics. See ITALIAN LANGUAGE AND LITERATURE.

TASTE, one of the special, or *exterior*, senses—the one through which we recognize certain substances when they are taken into the mouth. The sense of taste is located in the mucous membrane on the upper side of the tongue and the upper back part of the mouth. On this membrane are numerous minute elevations called *taste buds*, containing the endings of the nerve filaments which convey the impulse to the taste centers in the brain. When the sensation is registered by the brain centers, it is identified as *sweet*, *sour*, *bitter*, or *salty*. All taste sensations are formed by combinations of these, or by combination of one of them with the sense of smell. These two special senses are very closely related, and it often happens that smell sensations are mistaken for those of taste. Also, when the sense of smell is deadened by a cold in the head, the victim usually complains that he cannot taste well, or that all foods taste alike. The "mouth-watering" that occurs when an appetizing odor greets the nostrils is another example of a delicate relationship existing between smell and taste. In this case, there is stimulation of the salivary glands, brought about by anticipation of the enjoyment of eating.



Photo: Visual Education Service

A Proud Boy of Burma. Example of the art of tattooing as practiced in the East Indies.

The sense of taste is one that can be trained. In the grocery trade, for instance, the buyers use this sense in appraising the quality of coffee, tea, butter, and other commodities. It is also a sense that will become tired if not used with discretion, and since it adds greatly to one's ability to enjoy life, it should not be abused. People who indulge to an excessive degree in candies, highly seasoned foods, and the like impair their power to enjoy them. The ideal way is to eat plain food, as a rule, and delicacies but occasionally. If such a method is followed, the sense of taste will not become vitiated. K.A.E.

Related Subjects.

In connection with this discussion of taste, the reader may consult the following articles in these volumes:

Mouth	Smell
Senses, Special	Tongue

TATARS, *tah' lahrz*. See TARTARS.

TATE, NAHUM. See POET LAUREATE.

TATTOOING, the savage art of making permanent scars in patterns on the skin. It originated as a purely decorative custom, but among some races it grew to have a religious or tribal significance. Real tattooing can be practiced successfully only by light-skinned people, for it includes rubbing colors into freshly made abrasions of the skin. Needles of steel, bone, or shell are used to puncture the designs in groups of lines and dots, and one or several colors are employed to set the patterns permanently. The Polynesians confine themselves to black pigment, which turns to blue in the skin, but the Japanese use three or four colors. Dark-skinned races practice a related art, *scarification*, or gashing the skin and rubbing in ashes, charcoal, or clay, which causes light, raised scars. Another method, known as *branding*, consists in inserting splinters of wood in the skin and setting them afire.

As civilization spreads, tattooing dies out, though sailors often have designs, usually of nautical subjects, tattooed on the body.

TAUGHANNOCK, *taw gan' uk*, FALLS. See NEW YORK (Physical Features).

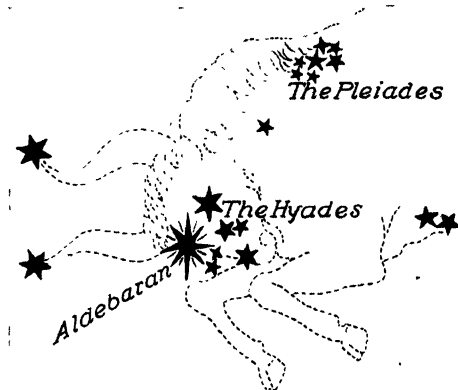
TAUNTON, MASS. See MASSACHUSETTS (back of map).

TAURUS, *taw' rus*, THE BULL, the second sign of the zodiac, into which the sun enters about April 20. The symbol of this sign is ♉. The constellation Taurus contains, altogether,

about 140 stars visible to the naked eye; in the northern hemisphere, it is overhead in December and January. The most remarkable star is Aldebaran, a red star of the first magnitude, which is shown in the illustration, blazing in the head of the Bull. The V-shaped cluster of Hyades forms the face of the Bull, and the beautiful group of the Pleiades is also in this constellation. In the Pleiades are very many stars, but only six are visible to the naked

eye, the brightest being called Alcyone. See PLEIADES.

In Mythology. The Bull, according to legends, is the bull into which Jupiter transformed himself when he carried away Europa, who became mother of Minos and grandmother of Deucalion, corresponding



THE CONSTELLATION TAURUS

The sizes of the stars indicate their relative magnitude.

to the Noah of the Deluge. In the ancient astronomy of India and Chaldea, the Bull also appears long before the Greek era. The Pleiades were the seven daughters of Atlas, all immortal except one, who gave up her immortality for love of a man, and whose brightness has vanished. The Hyades were half-sisters of the Pleiades.

F.B.L.

[For additional illustration showing position of the constellation in the heavens, see ASTRONOMY.]

TAURUS, a mountain range or series of ranges, in Southern Asia Minor, extending along the Mediterranean coast from the Euphrates River in the direction of the Aegean Sea. The mountains form the southern boundary of the Anatolian plateau, which occupies the central part of the peninsula of Asia Minor. Many peaks more than 10,000 feet in altitude rise in the Taurus ranges. An extension of the mountains on the northeast is known as the Anti-Taurus. See **TURKEY** (The Land and Rivers).

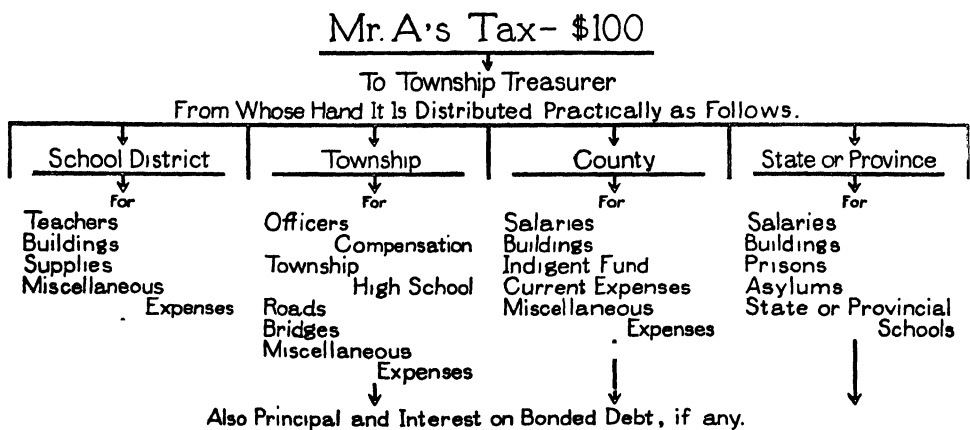
TAX AND TAXES. A tax is a compulsory payment from a person to the government, exacted to defray the cost of services performed for the common benefit, without reference to individual benefit. Every nation or government unit must have funds with which to meet its public expenses, such as the provision of education, the protection of life and property, and the construction of public improvements. These funds are obtained largely through taxation of the people.

Taxation as means of obtaining revenue has been employed from the earliest days of civilization. Many inscriptions testify that taxes were collected in Babylonia, Egypt, and other countries of antiquity, while, in both the Old and the New Testament, there is frequent reference to taxgatherers, or "publicans." In Europe, during the Middle Ages, most governments were supported chiefly from the income of lands owned by the government (public or national domain) or by the ruler himself; there were some regular taxes and numerous special fees, but a state system of taxation was practically unknown. In the European cities of the period, however, local taxes were collected with considerable system and regularity, and in many of these centers, only taxpayers were allowed the privileges of citizenship.

Kinds of Taxes. Taxes are of two principal kinds, *direct* and *indirect*. A tax which is not regularly shifted, but is borne by the person on whom it is imposed, is a direct tax; whereas a tax which is regularly shifted, by the person on whom it is imposed, upon others, who eventually pay it, is called an indirect tax. Local governments are maintained by direct taxation, but national governments depend on indirect taxes, as well as on direct.

The simplest kind of direct tax is a *poll tax*, literally, a tax *per head*. Such a tax is levied upon individuals, without reference to their property or employment. It was once an important source of revenue in many jurisdictions, but has been largely abandoned. The most important forms of direct taxes in operation to-day are those levied on *real estate* and *personal property*, and on *incomes*. Formerly, when there was less complexity in the economic structure, the tax on real or personal property was considered the most equitable form, because each person taxed paid according to his means. But in the modern, highly developed form of society, there is opportunity for much evasion; huge amounts of property escape taxation entirely. Stocks and bonds which may be concealed from taxing bodies are examples. Such evasion would be impossible under a just system of taxation, say the advocates of the single tax (which see), one of various substitutes suggested by economists. At the same time, the property tax will undoubtedly remain the most important levy for the maintenance of local government. The income tax is also theoretically a just tax, but here, too, there is opportunity for evasion and manipulation of returns. An *inheritance tax*, which is levied on estates transferred at death, was once generally considered to be a direct tax, but the Supreme Court has decreed it to be an indirect levy.

Indirect taxes are a main source of revenue for all national governments. They include,



chiefly, duties imposed on imported goods (customs duties), and taxes on the manufacture or sale of certain commodities (excise duties).

Theory of Taxation. It is just that a citizen should pay some revenue to a government which protects him and guarantees that he shall live, practically unmolested, in the enjoyment of his talents and property. Until about 1850, economists generally assumed that taxation was the price of protection. This view meant that taxes should be apportioned according to the benefit received, or according to the expenses incurred by the state in creating conditions which yield this benefit. This theory was weak in that neither the benefit nor the expenses could be figured exactly. In actual practice, taxation is now based on the theory that each individual is under obligation to contribute in proportion to his means and ability. This is an obligation derived not from special benefits, but from the very fact of a person's existence as a member of a civilized state.

Economists add several other characteristics to taxation. A tax should be in proportion to the means of the taxpayer, but it should not be so heavy that it discourages initiative. For example, if every factory employing more than twenty men were taxed one-third of its annual income, the manufacturer would soon close his shop. A tax should not be so heavy that it amounts to confiscation, but under special circumstances it should permit of great expansion. In war times, taxes might be doubled or trebled; under other conditions, they might be reduced. A system of taxation should be flexible and accommodate itself to conditions from year to year, but this flexibility should not cause additional expense. It is right that a citizen should pay taxes, but the expense of operating the machinery of taxation should not add to his burden.

Taxation in Practice. In the United States, the state and its subdivisions raise money only by direct taxation. All of the states have a general property tax, most of them have inheritance taxes, others have income taxes, and a few still have the poll tax. Inheritance, income, and poll taxes provide useful additions to the revenue of a state, but their uncertain character has so far prevented their adoption as the mainstay of a state system of taxation. In all the states, the general tax on property is the chief source of income for all the units of government.

The Mathematics of Taxes

The amount of tax levied by the government depends upon the expenses it must meet. The rate of tax depends upon the expenses to be met and the value of the property to be taxed. For example, the town of D has taxable prop-

erty assessed at \$10,000,000, and the tax to be raised is \$275,000. The rate of tax is $2\frac{3}{4}\%$, or $2\frac{3}{4}$ cents on the dollar, or $27\frac{1}{2}$ mills on the dollar. The rate is the relation of tax to the assessed value of the property, as shown below:

Before any money can be raised by property taxes, two fundamental questions must be answered—first, what is the value of the taxable property; and second, how much money is needed. The first question is answered by the assessors. Every owner of real or personal property is required by statute to file with the assessors a statement of his property, together with its "fair cash value." On the basis of these schedules, and on the results of their own investigations, the board of assessors fixes the amount on which the owner is taxed. If the owner feels that the assessed valuation is too high, he may ask the board of review to reduce it.

The second question is not answered so easily, because the tax paid by an owner, whom we may call Mr. A, is distributed among several governmental units approximately as indicated in the diagram which appears on the opposite page.

The most important man in this system is the township treasurer (in some states, however, the taxes are paid to the county collector or treasurer). All taxes are paid first to him, and are properly distributed by him. The taxpayers of a township must first pay the expenses of their township. But each township, being a part of the county, bears its share of the expenses of county government. The state, too, calls on each county for its share of the funds which shall maintain the state government. The amount of money which each unit is required to pay to the next higher unit is determined by the county board and state board of equalization, in proportion to the taxable property in each unit. Thus the state is really supported by the counties, which are supported in turn by the townships. It must be remembered, however, that the county and the township are created by the state; they tax in their own name, but they derive their authority from the state. The total amount needed for all purposes, divided by the assessed value of the property in the state, determines the tax rate; for example, if \$1,000,000 is needed for all expenses, and if the value of all property is \$200,000,000, the tax rate is $\frac{1,000,000}{200,000,000}$, or $\frac{1}{200}$, or one-half of 1 per cent. Standing somewhat aside from these other units is the school district, which is a division of the township or county for school purposes; in practically all states, the voters in a school district pay special taxes for the support of the schools in that district.

E.J.

$$\begin{array}{r} \text{Rate } \frac{275000.00}{1000000} = \frac{275}{10,000} = 2\frac{3}{4}\% \\ \text{Tax on \$1 } \frac{\$275,000.00}{10,000,000} = \$.02\frac{3}{4} \end{array}$$

In the town of D, a person owning property assessed at \$16,500 will pay in taxes .02 $\frac{3}{4}$ of \$16,500, or \$453.75.

Problems. 1. There is to be raised in a certain town for a new school a tax of \$8000; the assessed valuation of property is \$400,000. What is the rate of taxation? What is the tax of Mr. James, who owns property assessed at \$1,350?

SOLUTION

$$\begin{array}{l} \text{Tax} = \$8000 \\ \text{Assessed valuation} = \$400,000 \end{array}$$

$$\text{Rate of tax} = \frac{8000}{400000} = 2\%$$

$$\text{Mr. J's tax} = .02 \text{ of } \$1,350 = \$27$$

2. In a certain large city, the tax needed was as follows: for the state \$1,300,150, for the county \$1,800,000, for the city \$5,478,300, for the schools \$6,000,000, for the parks \$1,500,800. The city property was valued in full at \$1,286,340,000. Property was taxed on $\frac{1}{5}$ of full value. What was the rate of taxation? What was the tax of Mr. N, who had property valued at \$7500, full value?

SOLUTION

State tax.....	\$ 1,300,150
County tax.....	1,800,000
City tax.....	5,478,300
School tax.....	6,000,000
Park tax.....	1,500,800

$$\text{Total.....} = \$16,079,250$$

$$\text{Assessed property value} = \frac{\$1,286,340,000}{5} = \$257,268,000$$

$$\text{Rate} = \frac{\$16,079,250.00}{\$257,268,000} = .06\frac{1}{4}$$

$$\text{The assessed value of Mr. N's property} = \frac{\$7500}{5} = \$1500$$

$$\text{Mr. N's tax} = .06\frac{1}{4} \text{ of } \$1500 = \$93.75$$

3. In the town of E, a tax of \$20,000 is needed; there are 380 polls, each paying \$2. How large a property tax must be raised? Ans. \$19,240.

4. If the rate of tax is \$13 on every thousand dollars' valuation, what is the tax of a person owning property valued at \$7,000? Ans. \$91.

5. At \$1.75 on \$100, what is the rate of tax in per cent? What is the tax on property assessed at \$8000? Ans. 1 $\frac{3}{4}$ %; \$140.

6. The rate of state tax is 1 mill, of county tax 3 $\frac{1}{2}$ mills, of town tax 4 mills. What is the tax of a property owner in that town on property assessed at \$8000?

SOLUTION

$$\begin{array}{l} \text{Rate} = .008\frac{1}{2} \\ \text{Tax} = .008\frac{1}{2} \times \$8,000 = \$68 \end{array}$$

Problems Involving Duties. 1. What is the duty on a shipment of perfumery bought in Paris for \$420, weighing 125 pounds, ad valorem duty 50% and specific duty \$.60 per pound?

SOLUTION

$$\begin{array}{l} \text{Invoice price} = \$420 \\ \text{Ad valorem duty} = .50 \times \$420 = \$210 \\ \text{Specific duty} = 125 \times \$.60 = \$75 \\ \text{Total duty} = \$285 \end{array}$$

2. The duty on canned fish is 30%. What is the cost to the merchant of importing a lot of sardines costing \$625 in Italy?

$$\begin{array}{l} \text{Invoice price} = \$625.00 \\ \text{Ad valorem duty} = .30 \times \$625 = \$187.50 \\ \text{Total cost} = \$812.50 \end{array}$$

3. The ad valorem duty on a shipment of gloves at 60% was \$172.50. What was the invoice price of the lot?

$$\begin{array}{l} \text{Ad valorem} = \$172.50 \\ \text{Rate} = 60\% \\ \$172.50 = .60 \times \text{invoice price} \\ \text{Invoice price} = \frac{\$172.50}{.60} = \$287.50 \end{array}$$

Suggestions as to Teaching the Subject. (a) Students should secure a good knowledge of relations of people and government, needs of the government, public obligations, etc.

(b) They should find out the many needs for money in their own school district, village, city, and so on.

(c) They should understand how the assessor, collector, and treasurer obtain office, etc.

(d) They should discuss the rate of tax in their own locality.

(e) They should know something of the tariff system historically.

(f) They should know that the invoice price of imported goods is found in the manifest attested by the American consul at the foreign city from which the imported goods are shipped.

(g) In general, students should have an intelligent grasp of the *civil, social, and industrial conditions that give rise to tax problems*. American tariff schedules can be secured by writing to the Department of the Treasury at Washington. Students should obtain these.

Related Subjects. In the articles listed below the reader will find detailed discussion of the various forms of taxation, together with pertinent supplementary information:

Assessor	Internal Revenue
Customs Duties	Poll Tax
Economics	Protection
Free Trade	Sales Tax
Income Tax	Single Tax
Inheritance Tax	Tariff

TAXATION WITHOUT REPRESENTATION. See REVOLUTIONARY WAR IN AMERICA (Causes of the War).

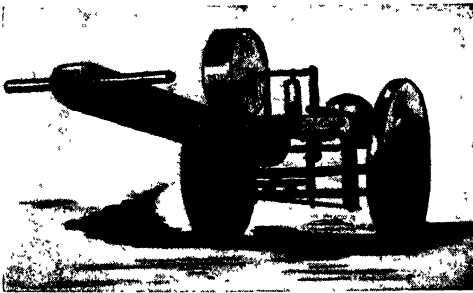
TAXICAB, tak' sih kab, a public motor vehicle used chiefly in cities to carry passengers for hire. It is an example of specialization in automobile-making, and has taken the place of the cab or coach drawn by horses. High-grade taxicabs are fitted with all possible comforts for the passengers, such as drop seats



MOUNTING THE HEAD OF A DEER

From left to right: Plaster cast of head, made after skin was removed; the same, with eyes inserted; the complete job, with skin, velvet antlers, and board mount.

for children, side pockets for papers and programs, cigar lighters, and electric lights. These vehicles are equipped with *taximeters*, automatic devices which register the mileage covered and record the amount of the fare. Maximum rates are fixed by city ordinances, and fares are collected on the basis of the distance covered, or according to the time con-



AN EARLY TAXICAB

A Chinese public conveyance, three centuries old. It was provided with a mechanical register in the form of a drum, which was beaten by a hammer at the end of each mile.

sumed. There are other regulations as to number of passengers, seating capacity of vehicle, time used in waiting for passengers, time lost because of breakdowns, insurance requirements, etc.

Generally speaking, rates in Europe are lower than in the United States, partly because there are very many more privately owned automobiles in the latter country than anywhere in Europe, but largely because of America's higher standard of living. Paris

is famous for the cheapness and excellence of its taxicab service.

TAXIDERMY, *tak' sih dur mie*. The visitor in a zoölogical museum is usually impressed by the natural appearance of the mounted animals exhibited. Often these are shown much as they lived in their native haunts; that is, in a picturesque setting of woods or water. Birds, fish, squirrels, larger common woodland mammals, and wild beasts of the jungle, even elephants, are exhibited in a most realistic manner. The science by which animals are thus preserved and represented is known as *taxidermy*.

As taught at the present time, taxidermy is a complicated art which requires a considerable knowledge of anatomy, natural history, drawing, modeling, carving, sculpture, mechanics, tanning, and dyeing. Ward's Natural Science Institute, at Rochester, N. Y., is the most famous taxidermic school in the United States, and most of the American museum experts have been graduated from this establishment. An excellent taxidermic department is also maintained by the United States National Museum, at Washington. Some of the world's greatest experts in taxidermy are connected with the American Museum of Natural History in New York City.

The complete process of mounting, in general, is as follows: Accurate measurements of the skin are made, and a drawing is worked out which shows the location of muscles, ribs, and hollows. This copy is used as a guide. Next a manikin corresponding to the body of the animal is constructed by covering a framework of wire and excelsior with clay, plaster,

or papier-mâché. The modeling of such a figure must be done as carefully as if it were intended to be a sculptor's model. By means of a special method of cutting, the skin is removed from the body, even to the ends of the toes and the tips of the ears. This stripping is done so skilfully that there is no injury or disfigurement of the fur, hair, feathers, or scales, as the case may be. After the skin is removed, it is treated with some preservative



HOW A FISH IS MOUNTED

The body is made of one-inch pieces of wallboard, glued together, cut out with a band saw, and shaped on a buffing lathe. The work is completed by stretching the skin over the wallboard body.

compound, such as arsenical soap. Finally, the skin is put on the manikin, and is carefully sewed together at the points where slits were made in stripping it from the body.

The details as to shaping the ears, putting in the eyes, tongue, lips, etc., and otherwise accurately reproducing the animal, are numerous and complicated. Glass eyes are no longer used; they have been replaced by hollow globes, painted so as to give a natural expression.

Derivation. The word taxidermy is derived from two Greek words meaning *arrangement* and *skin*.

TAXONOMY, *tak sahn' o mie*. See CLASSIFICATION; BOTANY (Organized Botany).

TAYGETA, *tay ij' e tah*. See PLEIADES.

TAYLOR, [JAMES] BAYARD (1825-1878), an American poet, essayist, and traveler, was born at Kennett Square, Pa., of Quaker ancestors. He received only a high-school education, and began life as a printer. When but nineteen years old, he made a visit to Europe, in the course of which he tramped from place to place and supported himself by writing letters, which were afterward published in book form under the title *Views Afoot*. He was a born traveler, and journeyed in his later years in Asia Minor, Egypt, China, Japan, and various countries of Europe, and wrote many volumes descriptive of the scenes and peoples he visited. During the War of Secession, he was secretary

to the legation at Saint Petersburg (the present Leningrad), and in 1878 became United States minister to Germany. He died in Berlin.

Taylor's most famous work is his translation of Goethe's *Faust*, which is probably the best in the English language. It was, however, his travel volumes which won him widest reputation during his life, and for which he is most generally remembered. His own great ambition was to be known as a poet; but, while his works all show poetic talent, and some of them, as the *Bedouin Song*, have retained their popularity, they lack the indescribable quality that would make them really great.

What He Wrote. Among his writings are *El Dorado*, a description of California in the days of gold-seeking; *By-Ways of Europe*; *A Visit to India, China, and Japan*; four novels, of which *Hannah Thurston* is the best; and the volumes of poems: *A Book of Romances*, *Lyrics*, and *Songs*; *Poems of the Orient*; *Lars*, a Pastoral of Norway; *The National Ode*; and *Prince Deucalion*.

TAYLOR, JEREMY (1613-1667), a famous English preacher and author, born at Cambridge and educated at Caius College, Cambridge University. Gaining the favorable notice of William Laud (which see), he was accorded a fellowship at All Souls, Oxford, and was made chaplain to Charles I. To the latter's cause he remained loyal throughout all the years of the Civil War, which ended in the execution of the king in 1649.

Before the outbreak of the struggle, he had been appointed rector of Uppingham, but he lost that post, and during the early part of the war was in the royal army as chaplain. For a time he was imprisoned in Wales, and after his release remained in that country, teaching school and writing. At the Restoration, he was made bishop of Down and Connor, in Ireland. Notwithstanding the fact that his position there was rendered unpleasant, he remained, faithful to his duties, until his death.



Photo: Brown Bros

BAYARD TAYLOR



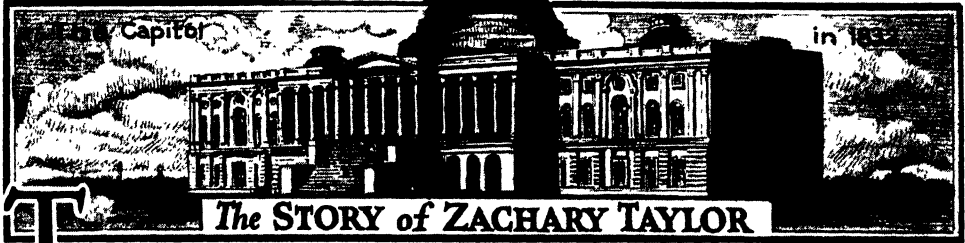
Photo: Brown Bros.

JEREMY TAYLOR

His Writings. His most famous works are *The Liberty of Prophesying*, *Great Exemplar*, *a History of Jesus Christ*, *Holy Living*, and *Holy Dying*. These, as well as his sermons, are models of eloquence, and they abound in poetic imagery and evidences of a rich and fertile imagination.

TAYLOR, JOSEPH W., the founder of Bryn Mawr College (which see), a prominent institution for the higher education of women.

TAYLOR, PA. See PENNSYLVANIA (back of map).



TAYLOR, ZACHARY (1784-1850), an American soldier, whom the fortunes of war elevated to the highest American honor, making him the twelfth President of the United States. Taylor was the second President to die in office, William Henry Harrison, the first, having died only nine years earlier. Taylor's untimely death, coming only sixteen months after his inauguration, cut off his political career at its very beginning, for he had held no political office of any kind previous to the Presidency. He was a soldier for forty years, and it was his reputation as the hero of the Mexican War that was the decisive factor in making him President. Without political training, he saved himself through his courage, his conscientiousness, and his good judgment. These carried him through difficulties in which the training of the politician would have been worthless. Conscious of his inexperience, he relied on the advice of others, but his judgment kept him steady amid confusing, conflicting counsels. Had he lived to serve out his term, the soldier would almost surely have proved himself a statesman of a high order.

Zachary Taylor was born in Orange County, Va., on November 24, 1784. He was the third son of Colonel Richard Taylor, a Revolutionary officer. At the close of the war, Colonel Taylor retired to his Orange County plantation, but in 1785 he removed to Kentucky, which was then part of Virginia, and took up a farm near the present city of Louisville. Of formal schooling young Zachary had none. The new settlement offered few opportunities for scholastic training, but it did teach thrift, industry, and self-denial. It also taught many things about war and military life, for many of Colonel Taylor's neighbors were Revolutionary soldiers who had received grants of land from Virginia. Before the colonel's wide hearth were told stories of the dark days of the Revolution, and reminiscences of brave deeds. Undoubtedly, this military past had its influence on the Taylor boys, for all but one of the five joined the army.

Early Career in the Army. During young Zachary's early manhood, the United States became involved in disputes with France and Great Britain over the rights of neutral commerce and other matters affected by the Napoleonic wars. In 1808 the status of these disputes seemed to point to immediate war with Great Britain. Congress authorized an increase in the size of the army, and in one of the new regiments, the Seventh Infantry, Zachary Taylor was appointed first lieutenant. Two years later, he was promoted to the rank of captain, and about the same time was married to Miss Margaret Smith, the daughter of a Maryland planter (see below).

In June, 1812, war was declared against England. This action made it almost certain that the Indians allied with the British would begin raids. One of the points of attack would be Vincennes, on the Wabash River. To protect Vincennes from a surprise attack, Captain Taylor, with his company of fifty men, was ordered to Fort Harrison, a stockade on the river above Vincennes. Here the little force was attacked by a large band of Indians, led by Tecumseh; it was beaten off so effectively that, for months afterward, no Indians could be found in this section. For the defense of the fort, Captain Taylor received the brevet rank of major, which was later confirmed by commission. Major Taylor was in active service against the Indians in the Wabash and Rock River valleys until the close of the war.

Indian Campaigns. At the close of hostilities, because of changes in the army organization, Taylor was reduced to the rank of captain. Regarding this as an injustice, he resigned his commission and returned home. Some influence, not stimulated by himself, secured his restoration to the rank of major. As lieutenant colonel, he later commanded at Fort Snelling, then the border post of the Northwest, and as colonel was in charge of Fort Crawford, at Prairie du Chien (Wisconsin), when the Black Hawk War began. Colonel Taylor served through the campaign, and himself re-

ceived the surrender of Black Hawk. Four years later, in 1836, he was sent to hold a command in Florida, and in 1837 defeated the Seminole Indians in the decisive Battle of Okechobee, a victory for which he received the



Photo: U & U

ZACHARY TAYLOR

One of the numerous Americans who were made national heroes by war and afterward raised to high civil office.

brevet rank of brigadier general. In 1838 he assumed chief command in Florida, and in 1840 was assigned to command the southern division of the western department of the United States army.

In the Mexican War. As the commander of this division, he was naturally given the task, in 1845, of defending Texas from threatened invasion by the Mexicans. Texas had entered the Union, so it said, with the Rio Grande as its boundary; it asked protection for this frontier, and General Taylor was to advance to that river. Collecting a force of about 4,000 men, both regulars and volunteers, at Corpus Christi, he advanced to the Rio Grande, and halted on its bank, opposite Matamoras. There the Americans built Fort Brown. General Ampudia, the Mexican commander, demanded that the Americans retire beyond the Nueces River, which they claimed as a boundary. Taylor promptly refused. In order to obtain more supplies, Taylor took half of his force to Point Isabel, his base, thirty miles away. On the

second day of the return trip, a force of 6,000 Mexicans opposed the further progress of his troops. Most of the officers were in favor of falling back to Point Isabel, to await reinforcements, but Taylor, after listening to the arguments, said: "I shall go to Fort Brown or stay in my shoes," a Western expression equivalent to "die with my boots on." Although outnumbered three to one, the Americans attacked early on the morning of May 8, 1845, and in the battles of Palo Alto and Resaca de la Palma, routed the Mexicans, who fled across the Rio Grande and left open the way to Fort Brown. On May 18 General Taylor's force occupied Matamoras.

In the meantime, on May 13, war had been formally declared. General Taylor then prepared to advance into Mexico, as the Rio Grande was an unsatisfactory strategic boundary. With 6,625 men he marched against Monterey, which surrendered on September 24, after a three days' bombardment. By the terms of surrender, the Mexicans agreed to retire behind a certain line, and the American troops agreed not to advance beyond it for eight weeks. This armistice was not approved by the United States government. Assuming, therefore, that the government was planning a further invasion of Mexico, General Taylor made preparations to that end, and was all but ready to advance, when he learned that General Scott had arrived at Vera Cruz with orders to take such troops and supplies as he needed, from Taylor's army. This was in the spring of 1847. Scott left Taylor only 5,000 unseasoned troops, to oppose General Santa Anna's army of 20,000. Santa Anna saw his opportunity, advanced to the attack, and met Taylor at Buena Vista, to which the Americans had withdrawn. There General Taylor's army won a brilliant victory over a vastly superior force, a victory which aroused great enthusiasm and made Taylor a national hero.

As a soldier, General Taylor ranks high. In the words of one who knew him well and understood him thoroughly:

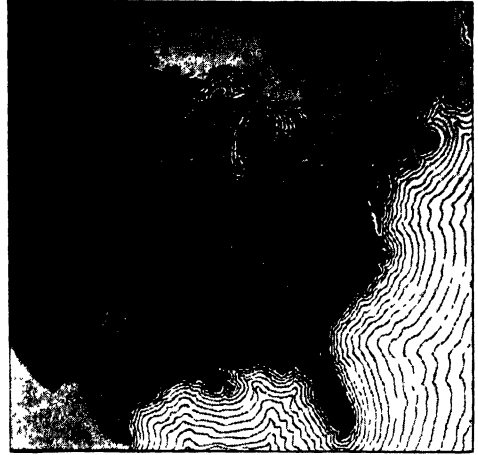
Unpretending, meditative, observant, and conclusive, he was best understood and most appreciated by those who had known him long and intimately. In a campaign he gathered information from all who approached him, however sinister their motive might be. By comparison and elimination, he gained a knowledge that was often surprising, as to the position and designs of the enemy. In battle he was vigilantly active, though quiet in bearing; calm and considerate, though stern and inflexible; but when the excitement of danger and strife had subsided, he had a father's tenderness for the wounded, and none more sincerely mourned for those who had bravely fallen in the line of their duty.

When the Mexican War was over, it seemed to General Taylor that the time had come to realize his dream of living again on a farm.

In 1842, when he took command of the southern division, he purchased a plantation near Baton Rouge, La., and later he planned to conduct a stock farm in the hills of Jefferson County. He had never felt any longing for political life, and he was always waiting for the day to come when he should be free to manage his private affairs. But his dream was not to be realized. His military career had made him a hero—"Old Rough and Ready," he was called. His popularity was seized by the Whigs to help preserve the party. As the Presidential campaign of 1848 approached, the Whigs had three possible candidates—Clay, Scott, and Taylor. Clay was still the party leader, but he had already been defeated three times. Scott had been a Presidential possibility for a quarter of a century, and there were good arguments against him.

There remained Taylor, who easily outshone Scott as the popular hero of the war. He was not the most logical candidate the Whigs might have chosen, perhaps, but he was the strongest. With him as the candidate, the Whigs won their second and last victory in a Presidential election. Taylor received 163 electoral votes to 127 votes for Lewis Cass, the Democratic candidate. The popular vote was close: 1,360,101 for Taylor to 1,220,544 for Cass. Van Buren, the Free-Soil candidate, received 291,263 popular votes, but no electoral votes. The campaign was fought without much

enthusiasm, and practically without an issue. Neither of the two great parties made an effort to rally the people to the defense of any important principle. As one historian remarks, somewhat sarcastically, practically the only



ELECTION MAP OF 1848

States in black gave their electoral votes to Lewis Cass, Democrat; cross-hatched states voted for Taylor, Whig. Gray area south of Canada and north of Mexico was unorganized territory.

thing it decided was that a Whig general should be made President, because he had done effective work in carrying on a Democratic war.

The Administration of Zachary Taylor

As President, Taylor had no friends to reward and no enemies to punish. He chose for his Cabinet men of national reputation, not one of whom was personally known to him. All the members of his Cabinet were lawyers, and all had served either in the Senate or in the House of Representatives. John M. Clayton, of Delaware, as Secretary of State, and Reverdy Johnson, of Maryland, as Attorney-General, were the best-known of the group.

Clayton-Bulwer Treaty. The settlement of the Oregon question and the acquisition of California naturally gave a new importance to the old plan of a water route across the Isthmus of Panama. In 1849 Nicaragua granted to a company of United States capitalists a concession for an isthmian canal, on condition that the United States should guarantee the neutrality of the canal, and also the sovereignty of Nicaragua over the territory along its course. Then, in order to forestall British interference, the United States obtained the cession of the island of Tigre, in the Gulf of Fonseca, on the Pacific side from Honduras. This gulf was the probable Pacific outlet of the canal, but Great Britain already controlled the Atlantic end.

This complication made necessary a readjustment of the Anglo-American relations, and re-

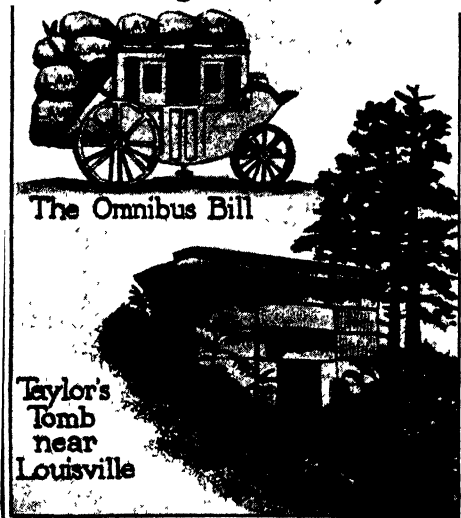
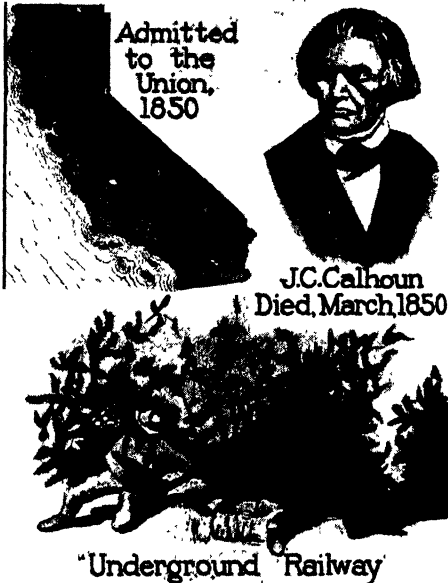
sulted in the Clayton-Bulwer Treaty of 1850. By this agreement, the two nations agreed to promote a canal across Nicaragua, and neither "would ever obtain or maintain for itself any exclusive control over the said ship canal" or "assume or exercise any dominion . . . over any part of Central America." The "neutrality and security" of the canal were guaranteed so long as there should be no "unfair discriminations" or "oppressive exactions" in its management.

The Compromise of 1850. One of President Taylor's first acts was to send agents to California and New Mexico, with instructions to urge the people of those territories to frame constitutions and apply for admission to the Union as states. But before the agents reached their destination, events had already moved in the desired direction. A convention was held in California in September, 1849, and a constitution was adopted which prohibited slavery. In Taylor's annual message, sent to Congress in December, there was reference to this movement in California to organize a state government, and to the prospect of similar action in New Mexico.

The first session of the Thirty-first Congress, in December, 1849, was remarkable for a fierce

The ADMINISTRATION of ZACHARY TAYLOR

1849 1850



struggle over the Speakership, the difficulty lying in the fact that a small group of Free-Soilers held the balance of power, and refused to vote for either the Whig or the Democratic candidate. In the course of this contest, the fiercest sectional antagonisms were stirred up, and conservative men everywhere were becoming alarmed for the safety of the Union. It was then that Robert Toombs of Georgia said:

I do not hesitate to avow before this House and the country, and in the presence of the living God, that if by your legislation you seek to drive us from the territories of California and New Mexico, purchased by the common blood and treasure of the whole people, and to abolish slavery in this district, thereby attempting to fix a national degradation upon half the states of this Confederacy, I am for disunion.

In this grave crisis, Henry Clay appeared in the Senate for the last magnificent effort of his career. On January 29, 1850, he introduced into the Senate eight resolutions, which, with some amendments, stand in history as the Compromise of 1850. Clay's great speech in support of the resolutions was made on February 5 and 6. Calhoun's reply came on March 4. It was read by Senator James Murray Mason of Virginia, for Calhoun was at the grave's edge and too weak to deliver it, but the veteran sat bravely in his seat. It was Calhoun's last public work; he died on March 31. Three days after Calhoun's speech, Webster delivered the Seventh of March speech, and in later weeks William H. Seward and Salmon P. Chase, newcomers in the Senate, were heard.

In April the resolutions were referred to a committee of which Clay was chairman, and on May 8 the committee reported two bills which would accomplish all that Clay wanted. One of these measures, the "Omnibus Bill," provided for the admission of California, for the organization of New Mexico and Utah as territories, and for a Texas boundary which would exclude any territory claimed by that state in New Mexico. The second bill provided for the suppression of the slave trade in the District of Columbia, and for a more effective enforcement of the Fugitive Slave Law. Before much progress was made with these bills, Taylor died suddenly, on July 9, 1850, after an illness of four days. His remains were placed in the family cemetery near Louisville, Ky. The succession fell to Vice-President Millard Fillmore.

The two bills as drafted by Clay met little favor in Congress, but their substance was finally recognized as the necessary compromise. Special bills on each feature of the compromise were passed, in most cases by a large majority. Thus the final decision as to peace or war was postponed for another decade, when the fires which had flamed fitfully from time to time became a steady blaze. In that greater conflict,

OUTLINE AND QUESTIONS ON ZACHARY TAYLOR

Outline

I. Early Years

- (1) Birth and parentage
- (2) Lack of education
- (3) Effect of "war stories" in determining choice of vocation

II. Military Career

- (1) Appointment as first lieutenant
- (2) War of 1812
 - (a) Defense of Vincennes
 - (b) Made major by brevet
- (3) Indian warfare
 - (a) Reduction and re-promotion
 - (b) Black Hawk War
 - (c) War against Seminoles
- (4) The Mexican War
 - (a) Assigned defense of Texas
 - (b) Encampment on Rio Grande
 - (c) Battles of Palo Alto and Resaca de la Palma
 1. Superior Mexican forces
 - (d) Occupation of Matamoras
 - (e) Capture of Monterey
 - (f) Coming of General Scott
 - (g) Battle of Buena Vista
 1. Superior Mexican force
 - (h) Victories factor in determining future career

III. Election of 1848

- (1) Possible Whig candidates
 - (a) Reason for choice of Taylor
- (2) Absence of sharp campaign
- (3) Victory of Taylor

IV. Administration

- (1) Choice of Cabinet
- (2) Treaty with Nicaragua
- (3) The Clayton-Bulwer Treaty
 - (a) "Neutrality and security" of isthmian canal guaranteed
- (4) Compromise of 1850
 - (a) Rising public sentiment
 - (b) Great speeches on the question
 - (c) Terms of Compromise
 1. California admitted as free state
 2. New Mexico and Utah organized as territories
 3. Slave trade suppressed in District of Columbia
 4. Fugitive Slave Law enforced
 - (d) Immediate results
 - (e) Later effects
- (5) Death of President

V. Summary

- (1) Character of Taylor
- (2) Rank as soldier
- (3) Political possibilities

Questions

What does the expression "stay in my shoes" mean, and under what circumstances did Taylor make use of it?

Quote from a speech which indicates clearly the degree to which a feeling of animosity between North and South on the slavery question had increased.

How did Taylor's rise to the Presidency resemble that of Grant? How did it differ from that of Harrison?

What connection did the head of the Confederacy have with Zachary Taylor?

What statesman during this administration wrote a great speech, but was too weak to deliver it?

What was the occasion of this speech, and what other famous statesmen took part in the controversy?

With what famous Indian chief did Taylor come into conflict?

What battle really won for Taylor the Presidency, and what were the circumstances that made this battle such a triumph?

What was Taylor's popular nickname?

How did a treaty with Nicaragua make necessary a treaty with Great Britain, and what were its terms?

What characteristics of Zachary Taylor enabled him to serve creditably as President, though not a politician?

President Taylor's only son, Richard (1826-1879), played a conspicuous part as a Confederate general. His son-in-law, the husband of Sarah Taylor, was Jefferson Davis. E.D.F.

Margaret Smith Taylor (1788-1852), the daughter of Walter Smith, a Maryland planter. When she entered the White House, she had probably had more varied experiences than any other President's wife. For years she shared with her husband the hardships of a frontier soldier. It was during this time that her five daughters and one son were born, and as soon as each child was old enough, it was sent back to the safety and educational advantages of the "settlements."

When the Taylors settled at Baton Rouge, where they could be united as a family, it was with no thought that war with Mexico was to focus on their quiet border, and that its events would make General Taylor a popular national hero.

Margaret Taylor's reluctance to assume responsibility in the life of the White House was criticized by her husband's enemies, but she consistently refused, and the mistress of the mansion was her daughter, "Miss Betty Taylor," wife of Major W. W. Bliss. The death of President Taylor occurred in the White House, and Mrs. Taylor survived him only two years, dying at the home of her only son, in Louisiana.

Sarah Knox Taylor married Jefferson Davis, against her parents' wishes, and died before a reconciliation with her father was effected.

Related Subjects. The reader who desires additional information respecting events connected with the life and times of this President is referred in these volumes to the following articles:

Black Hawk
Calhoun, John C.
Clay, Henry
Clayton-Bulwer Treaty
Compromise of 1850
Fillmore, Millard
Fugitive Slave Laws
Mexican War

Nicaragua Canal
Political Parties
Santa Anna, Antonio
Lopez de
Scott, Winfield
Tecumseh
United States
(History)



Photo: U & U

MARGARET SMITH TAYLOR

reach Dundee at all stages of the tide. A railroad bridge over two miles long spans the estuary. The Tay is one of the most beautiful of Scotland's many picturesque rivers, and it also enjoys great repute as a salmon stream; at Hormonthfield, near Perth, there is a hatchery for the breeding of these fish. See SCOTLAND (Rivers and Lakes).

TCHAD, *chahd*, a form of the word *Chad* (which see).

TCHAIKOVSKY, *chi kawf' ske*, PETER ILVITCH. See TSCHAIKOVSKY, PETER ILVITCH.

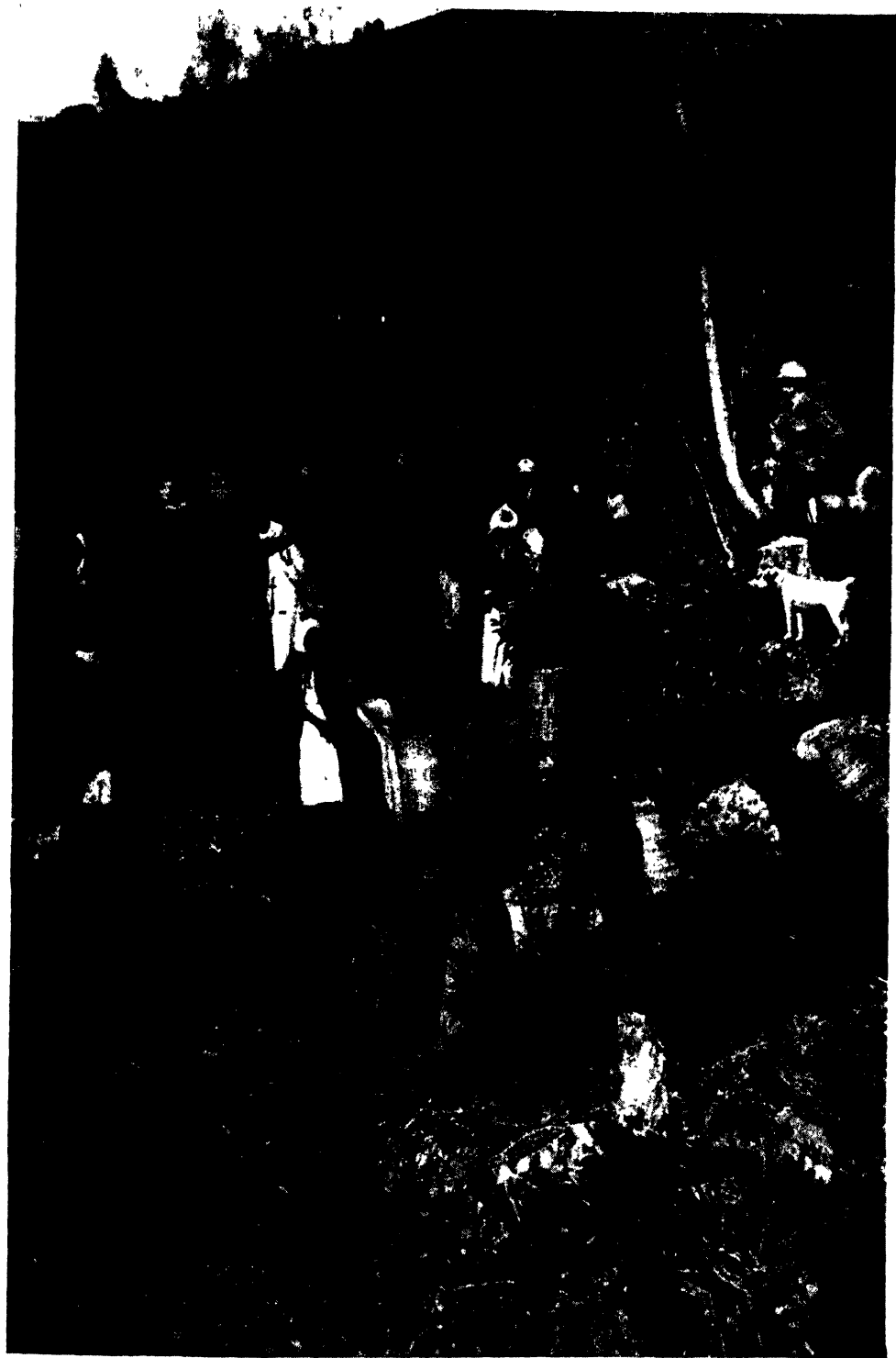
TCHERKESES, *chur kes' ez*. See CIRCASSIANS.

TEA, a beverage brewed from the leaves of an Oriental evergreen tree, in popularity yielding only to coffee, among unfermented drinks. Millions of people in all parts of the world use it daily, and it can almost be called the national beverage of Japan, of China, and of England. For many years, it has been the custom of the English to partake, in the afternoon, of a social cup of tea. English fiction abounds in references to tea-drinking, and this indicates its place in the life of the people. When Japan and Russia contended for supremacy in Northeastern Asia, in 1904-1905, the Japanese effectually warded off disease by drinking tea instead of water, for in war zones it is difficult to obtain the latter in a pure condition; tea, on the other hand, is a sterilized drink. In Japan itself, social tea-drinking is a ceremony having definite rules of etiquette.

Tea is associated with much that is delightful in life, but, like many other good things, it should be enjoyed in moderation. Its two principal constituents are caffeine and tannin (see these titles). The former is mildly stimulating in small amounts, but produces injurious effects on the nervous system when taken in large quantities. Tannin is a poisonous principle, and it is not soluble in water, except when boiling is carried on for a long time. If one pours boiling water on the leaves, and then pours out the tea as soon as it has acquired the desired strength and flavor, the beverage will not have the bitter taste that reveals the presence of tannin. When tea is properly made and is not drunk to excess, it is harmless for most adult people. See HOME ECONOMICS (Buying for the Table).

The Tea Plant. Under cultivation, the tea plant, which belongs to the same family as the camellia, is a branching shrub from two to six feet in height. On tea plantations, it is kept to small size by constant pruning, for the purpose of increasing the number of leaves, but in its natural state, it grows as a tree thirty feet or more in height. The tea gardens or estates are planted to small bushes four or five inches high, which have been grown from seeds in nurseries. The small plants are set close together in rows, sometimes as many as 1,500 to

TAY RIVER, the longest stream of Scotland, with a length of 117 miles. This river carries more water to the sea than any other stream in Great Britain. It rises in Ben Lui (3,708 feet), a mountain on the boundary between Perthshire and Argyllshire, flows through Loch Tay, passes Dunkeld, Aberfeldy, Perth, and Dundee, and enters the North Sea through the broad estuary known as the Firth of Tay. In portions of the river, dangerous floods have occurred at various times. Navigation is seriously obstructed by shifting sandbanks and swift currents, but the river is navigable to Perth for small vessels, and the largest ships



In Southern India. Native tea-pickers work about twelve hours a day, and for this arduous labor receive the equivalent of less than thirty cents.

the acre. At the end of three years, a bush begins to be commercially profitable, but does not produce a full crop for at least two years more.

The chief tea-growing countries are India and Ceylon, the Dutch East Indies, China, and Japan and Formosa. An abundance of rainfall and a hot climate are especially favorable to the production of this plant. In Japan and China, the plants are grown in comparatively small gardens, but in Java, Ceylon, and India, there are vast estates, some of which produce more than a million pounds of tea a year. In Ceylon, India, and Formosa, where warm weather always prevails, picking may occur as often as once a month; in cooler climates, two to four times a year.

A field in full blossom is a charming sight, for the rose-colored or cream-white flowers are very lovely against the background of green stems and thick foliage. The leaves of the plant are long and leathery, somewhat resembling those of the willow tree. The finest quality

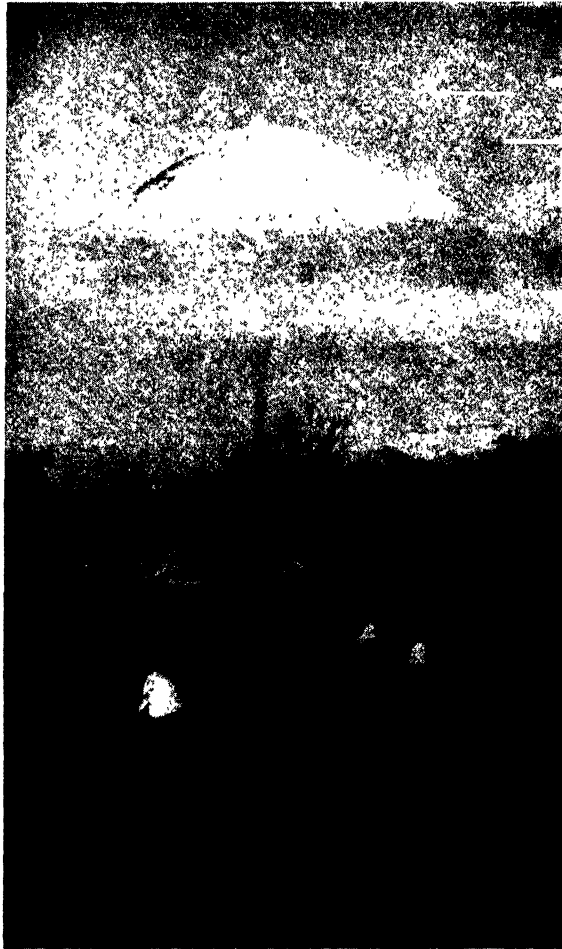
of tea is yielded by the young, tender leaves closest to the end of the branches, while the older and coarser ones, nearer the trunk of the shrub, are utilized for cheap brands.

Preparation for the Market. The first step in the manufacture of tea is the picking of the leaves. This is done entirely by hand, and it is a work in which men, women, and children engage. The leaves are dropped into baskets suspended from the shoulders of the workers. As the baskets are filled, the leaves are taken to the factory for curing. It is a somewhat prevalent idea that black tea and green tea are produced by two different varieties of

plant, but the difference is wholly a matter of preparation. The green variety is what makers call *unfermented* tea, and the black is *fermented*. Fermentation, in this instance, means about the same as oxidation—the leaves remain-

ing in the open air from twenty to thirty hours. In the case of fermented tea, certain oxidizing ferments in the leaf are permitted to remain in it. These ferments work chemical changes in the leaf, that give it its black color. At a certain stage in the process, when the organic nature of the leaf is on the point of being entirely changed, the fermentation is checked by the application of heat. In case of unfermented tea, the leaves are placed in a firing machine shortly after they are plucked, which prevents fermentation by closing the pores.

In black-tea preparation, the freshly plucked leaves are placed under cover on bamboo, canvas, or wire-netting trays, and left there for a day or two, to wilt. After this, they are



NEAR THE SNOW-CAPPED CONE OF FUJIYAMA
Tea-pickers in a beautiful setting near the Sacred Mountain.

crushed by being passed through powerful rolling machines, a process which brings the natural juices to the surface. The leaves are then spread out on tables, in cool, well-ventilated rooms, to ferment, as described above, after which they are again rolled, and then dried in the firing machines. Cutting machines now break up the pieces into uniform lengths, and the tea is finally sifted, graded, and packed for shipment. Green tea is fired twice, the second firing occurring as soon as the leaves are taken from the rolling machines. The heating process drives off water present in the leaf and brings out the natural fragrance of the tea. Some



Photo: U & U

Luncheon Time in an India Tea Field. Native girls resting from their labor beneath the welcome shade of beautiful arica palms.



teas are artificially scented by exposure to fresh flowers, and cheaper grades of green tea are frequently adulterated by the use of such coloring matters as powdered talc and Prussian blue.

Tea Exports. The tea exported each year from the four chief tea-producing countries amounts to nearly 800,000,000 pounds. Japan and Formosa, which are the most important producers of green teas, send the bulk of their output to the United States. Formosa also produces large quantities of

oolong tea, a black tea with the flavor of green, which has been partly fermented. The United States and Canada buy a small amount of green tea from Ceylon, India, and Java, but these countries are producers of black tea almost ex-



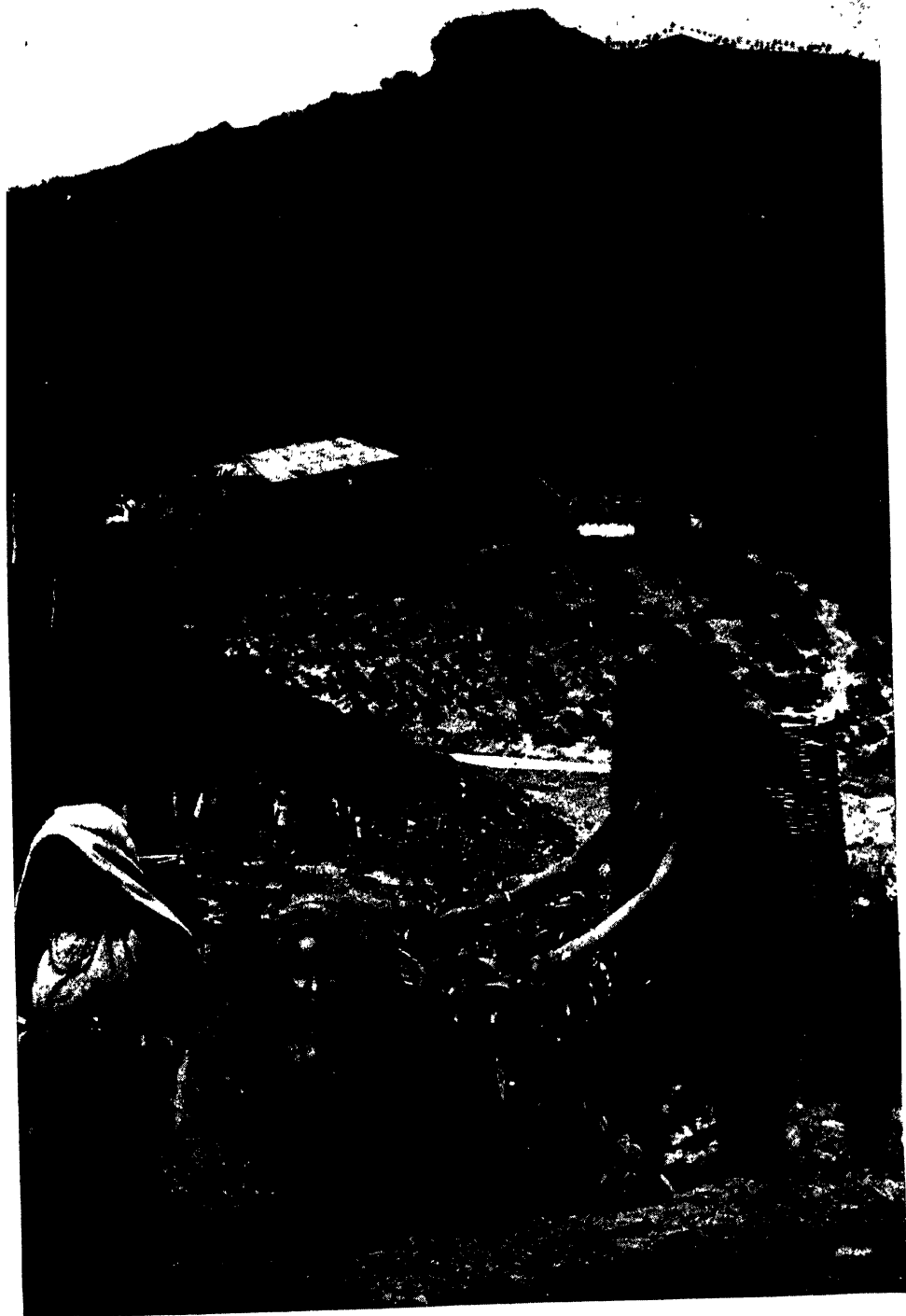
IN COLORFUL JAPAN

Above, a ceremonial tea. Below, serving tea under cherry trees heavy with blossoms.

clusively. Ceylon and British India supply the greater part of the English demand for black tea. China, which has a large American trade, produces both green and black varieties.

The Story of Tea. The Orient has a legend to account for the origin of tea. There was a saint in India, so the story goes, who prayed without ceasing for many years, and then one day fell asleep. On awakening, he was so grieved to think that he had let his weakness overcome him that he cut off his eyelids and threw

them on the ground. For five years more, he was able to continue his meditations, when he again felt sleep coming upon him. However, he chanced to chew some leaves from a convenient shrub, and received stimulation



In Ceylon. Native girls picking tea on the largest tea plantation in the island, owned by Sir Thomas Lipton.



Photo: Visual Education Service

AT THE END OF THE DAY

Native pickers in Java starting from the fields to the sorting sheds. Some of the tea bushes in the illustration have been trimmed to promote new growth, while others remain in full leafage.

which drove off his drowsiness. The world still uses tea to keep it awake. It is known that tea was used as a beverage in China as



TESTING TEA FOR PURITY

One of the most common adulterations of tea is the dyeing of the leaves to give them a good color. The fraud is not hard to detect. Place dry tea leaves between the folds of a clean, white cloth, and rub the folds together. If the tea is pure and has not been treated, no marks will appear on the cloth; dye stains will soil the cloth and be difficult to remove.

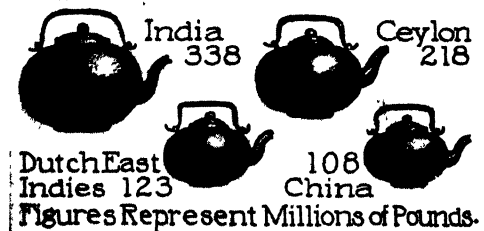
early as the sixth century, and was extensively cultivated in Japan in the ninth, but its virtues were unknown to Europeans until the seventeenth century, when it was introduced into Europe by Dutch adventurers who had learned about it from the Chinese. In the interesting

diary of Samuel Pepys, one may read this entry, dated September 25, 1666:

I did send for a cup of tea, a China drink, of which I had never drunk before.

This novel drink grew so steadily in favor that, by the close of the eighteenth century, it was being consumed by the English at the rate of two pounds a year per person.

The tea industry began in British India about 1834 under the auspices of the East India Company, whose monopoly on tea



ANNUAL PRODUCTION CHART
The principal countries from which the world gets its tea.

was abolished the same year, but the Dutch preceded the English in this field, for experiments in tea culture were made in Java as early as 1826. The industry was put on a

paying basis in Formosa about 1860, and in Ceylon in 1876. An enthusiast on the subject has paraphrased the Bible, thus:

Tea is better than wine, for it leadeth not into intoxication; it is better than water, for it doth not carry disease.

A Booklet on Tea

Use three sheets of paper 9 x 12 inches, or larger, and fold once, making twelve pages.

Cover page—*Story of Tea* in center; at bottom, name of pupil, grade, and school.

Illustration: Border of conventionalized blossoms.

Inside cover—Blank.

Pages one and two—Original story, *My Visit to a Japanese Tea Field*. Describe general appearance of field and tea-pickers.

Illustration: Sketch of field (see half-tones herewith).

Page three—Description of tea plant.

Illustration: "Close-up" view of a single shrub.

Page four—Essay, *The Good Things About Tea*.

Illustrations: Teapots and teacups of various designs.

Page five—Essay, *The Evils of Tea*.

Page six—The Oriental story of the origin of tea, told in the pupil's own words.

Illustration: Man in Chinese or Japanese garb.

Page seven—Essay, *Preparing Tea for Market*.

Illustration: Trays on which leaves are dried.

Page eight—Where tea comes from.

Illustration: Diagram or map showing countries that lead in production.

Inside back cover—Blank.

Back cover—Quotations on tea.

TEACHERAGE. See NORTH DAKOTA (Education).

TEACHERS, AMERICAN FEDERATION OF. The American Federation of Teachers is a national professional organization of classroom teachers affiliated with the American Federation of Labor. It was organized in 1916. A few teachers of social vision, who were thinking in terms of community interest and social progress, brought this organization into life, as a protest against what were claimed to be abuses of power that had grown up in school administration, and as a means for combating influences which seemed to be attempting domination of the schools.

The purposes of the organization are to bring associations of teachers into relations of mutual assistance and coöperation; to obtain for them all the rights to which they are entitled; to raise the standard of the teaching

profession, by securing the conditions essential to the best professional service; to promote such democratization of the schools as will enable them better to equip their pupils to take their places in the industrial, social, and political life of the community.

The chief aim of this group is to democratize the schools; to put into practice Professor Dewey's ideals of democracy in education. The slogan adopted is "Democracy in Education; Education for Democracy."

To accomplish this ideal, and to build a true profession, the fundamental needs seem to be the establishment of teacher tenure during efficiency, and the release of the teacher's voice in school administration. Since the adoption of this program, teacher-tenure laws have been enacted in twelve states, and others are considering them. Teachers' councils, controlled by the teachers and participating in the determination of educational policy, have been established in a few cities, on the American Federation of Teachers' principle that teachers should not be mere followers, but should be sharers in the making of educational and school-administration policies.

The sabbatical leave, with adequate compensation, has become operative in some cities, and has been accepted by them as a sound policy. Payment for absence due to illness, quarantine, or death in the immediate family, is another policy strongly advocated by the American Federation of Teachers.

Other measures which the Federation favors are: A pension after twenty-five or thirty years of service; a maximum of 1,500 pupils to a building and a maximum of thirty pupils to a class; elective boards of education, possessing financial independence and having teacher and labor representation; academic freedom for teachers and pupils, especially in the social and natural sciences; the right of married women teachers to employment; the single-salary schedule for those having equal qualifications; a cultural wage with annual automatic increments and a two-thousand-dollar minimum. F.C.H.

TEACHERS' COLLEGES. See SCHOOL (Special Schools).

TEACHING, MOTIVATION OF. The motivation of teaching consists in planning and teaching the work of the schools so that the tasks of the pupil are made significant and purposeful to each child, by relating them as closely as possible to his childish experiences, questions, problems, desires, and needs. The child's work is motivated whenever he sees a real use in it—whenever it satisfies some need he feels, provides some value he wants, supplies some control he wishes to possess, secures some desired end, or helps him to attain any definite goal.

A Definite Purpose in View. The goal sought may be near or remote—as near as

winning the prize in a spelling contest; as remote as gaining the ability and skill to construct a box kite. So long as a child comprehends, more or less clearly, the relationship between the work he is doing and the end sought, his work is motivated. The more definitely he appreciates this relationship, and the more keenly he desires to reach the given goal, the more impelling are his motives.

It has long been held that, if the school would be successful in its work, the teacher must be guided constantly, in every detail of her work, by a sensible, clear-cut, definite purpose. In recent years, it has come to be perfectly evident that, if the pupils' work is adequately motivated, they, too, must be working always under the guidance and inspiration of a definite, attainable purpose or goal. In other words, the activities and work of the school should be so planned by the teacher that questions of vital importance to the pupils are naturally asked by them, as the work progresses. These questions reveal the problems confronting the pupils and the needs they feel. The next work of the school should then be so planned that the pupils find their needs supplied, their questions answered, and their problems solved.

An Illustration. Under their teacher's leadership, the pupils of a school decided to remember the birthday of an elderly, poverty-stricken woman who lived all alone near the school. They not only wished to send her some flowers and a more enduring present, but, likewise, they planned to go to her home at the dinner hour on her birthday, taking with them food for a substantial dinner, and spending the early portion of the evening with her. The dinner was to be followed by an appropriate little program of entertainment, consisting mainly of a talk by one of the pupils presenting the gift, and of singing songs which they thought she would enjoy.

For a number of days, the execution of this plan afforded the children very profitable work. In the arithmetic class, they estimated how much each child should earn, in order that they might have enough money with which to buy the present and flowers, and meet the expenses of the dinner. In the composition class, they developed the talk which was to be made by the pupil presenting the gifts. In the music classes, they selected and practiced the songs which they sang on the evening of the birthday party. Under the inspiration of carrying through successfully what they had decided to do, their school tasks which enabled them to accomplish their end were interesting and attractive. They worked not only with enthusiasm, but with accuracy.

Interests and Tendencies. Any teacher who wishes to motivate the work of her pupils needs, in the first place, to be so familiar with

the interests and tendencies which are natural to children that she is able to think in terms of their attitudes and wishes, in planning her work. School work which is built upon one or more of the following tendencies or interests, which are normal to children, is rather certain to be well motivated.

(1) *Earning Money and Acquiring Property.* Though this tendency in children needs to be used guardedly as the basis for school work, yet every experienced teacher knows that, almost irrespective of a child's age or condition, difficult tasks become attractive if one result of his work is having some money or property of his own. As employed in school, this tendency is less dangerous if the commercial gain sought goes to a group or class, rather than to a single pupil. Writing or other contests, in which pupils have an opportunity to participate for commercial gain, are many, and excellent results to the children follow from participating in these contests, but due care should be exercised to avoid the objectionable results which follow from too great use of prizes of value in stimulating effort in school work.

(2) *Competing for Results, a Reward, or an Honor.* A pupil who is striving to attain any one of these ends through school work has a strong motive for effort. The instincts of ownership, ambition, emulation, rivalry, love of approbation, and courage are all appealed to. The efforts put forth by pupils in spelling, oratorical, music, and debating contests are largely the result of the native tendency in children to compete for results.

(3) *Playing Games.* Play is the dominant activity in childhood. Any work which may be done, or any result which may be accomplished through play or through taking part in a game, is strongly motivated. Any child willingly prepares and practices that he may do his part well in a game. He sees that his only right to take part with a group engaged in a game is ability to aid in winning the game. Modern education makes large use of the interest of children in such games as the relay race in spelling and numbers; bean bag in language, spelling, and numbers; mail carrier and Santa Claus in beginning reading; baseball in spelling and numbers; and so on. Games in great variety are employed in language work, in teaching polite usage and the correct use of idiomatic language. One reason why dramatization, which is so much used in reading and language work, secures such good results, is that the game and play elements are involved.

(4) *Making Things.* The constructive instinct is strong in children of all ages. They like to manipulate materials, and see what they can produce as a result. The small child works with its blocks to see what it can produce, while the child a little older may take paper and scissors, or a piece of wood and a jack-

knife. All of the constructive and manual-training work in the schools is largely based upon this interest of children. It results in the children making simple birthday or Christmas or Valentine gifts, for parents or other relatives. Often the children of an entire room or class unite to produce articles needed about the schoolroom or in the corridors of the building, such as a bookcase, a rug, a couch cover, curtains, or a pedestal for a piece of statuary.

(5) *Entertaining.* Children enjoy entertaining. They like to have the pupils of another room visit them, or to have their parents or other mature people come as their guests. The instincts of imitation, play, sociability, expression, ambition, rivalry, love of approbation, pride, and so on, find expression in entertaining. The wise teacher, recognizing this tendency in children, makes it the basis for securing good work in all of the subjects which are drawn upon when a program is developed to provide entertainment for the guests. Such programs will usually require music, story-telling, calisthenics, reading, and dramatization. The motive of entertaining well through these means supplies the impelling power which is necessary to good work in these subjects.

(6) *Sharing.* The activity of sharing is very similar to that of entertaining, and is based upon the same instinctive tendency. Just as the adult wishes to share with his friends the results of his labors, be they fragrant roses, a model dairy, or an exquisite painting, so children wish to share the products of their labors. Hard work becomes a delight when there is a prospect ahead of sharing with others the results of their efforts.

Good schools plan to give the children large opportunities for sharing with each other. Any interesting experience enjoyed by a group of children is shared with others who might enjoy it and profit by it. They might write it up and send it to different rooms, or send children to talk about it in the different rooms. The school assembly, in which the entire school meets, is an excellent plan for sharing with all the best that any room produces.

(7) *Advancing Self in the Estimation of Others.* Children, as well as older people, are anxious to be highly esteemed by others. What person is not happy in a task, regardless of its difficulty, if he sees that it will enable him to rise worthily in the esteem of others for whose good opinion he cares? Pupils strive hard for good grades, that the teacher may think well of them, that they may merit the esteem of their classmates, and that they may please their parents and others who care about their progress.

(8) *Promoting Self-Development.* This motive appeals more strongly with advancing years. It leads the student to undertake tasks involving long periods of effort, sometimes months

or even years. It impels the student of science to undertake difficult and extended investigations, to assume great risks, and to endure great privation. Success is assured when this motive becomes dominant.

Under the influence of this motive, students are found not only meeting the requirements of the teacher in the preparation of lessons, but visiting scientific and historical collections, and going to other sources of help outside of the school, such as to the city, college, or state library. Such students also insist upon solving their difficult problems and performing their science experiments unaided.

(9) *Preserving Products and Collections.* This motive has a strong basis in the instincts of collecting, ownership, preservation. Children collect and preserve beautiful stones, postage stamps, pictures, post cards, playthings, and so on. Older persons preserve letters, gifts, heirlooms, or scientific collections. This motive may be invoked in getting pupils to keep well-organized outlines and complete notebooks.

(10) *Mastering and Conquering.* The instinct to subordinate and control both matter and persons is one of the most imperious of man's tendencies. It asserts itself in infancy in the child's desire to know, to understand, and to rule or to lead in his group. It grows in strength with succeeding successes, and is checked only when ambition is crushed. The presence of this tendency in children is the school's greatest hope of getting the pupils to do their work. The school should train children to solve problems and to meet difficulties unflinchingly.

(11) *Fitting for a Life Career.* While not functional in early childhood, the goal of preparing for a successful life career becomes a strong motive quite early, with ambitious children. Under the stimulus of this motive, programs of work and hard tasks, extending over a series of years, are undertaken with enthusiasm and determination. An appeal to the child's desire for future success is seldom devoid of results, and is most often met with a hearty response and a renewed will to work. H.B.W.

TEAK, *teek*, a beautiful forest tree of the verbena family, native to Southeastern Asia. It is the source of a wood highly valued for shipbuilding and for furniture-making. The special qualities of teakwood are strength, durability, and resistance to water; in addition, it is easily worked, takes a high polish, and contains a resinous oil that makes it resistant to insects. In appearance, the wood resembles coarse mahogany. Teak trees sometimes grow to be 200 feet in height, and are generally found in groups in forests of other trees. The leaves, which are often two feet long and a foot and a half in width, yield a purple dye, and are also utilized for thatch and wrapping material. In British India and Burma, the cutting of teak and the transportation of the

logs to the sawmills constitute a flourishing industry that is under government control. Elephant labor is used to get the logs out of the jungles.

A tree known as *African teak*, or *African oak*, belonging to the spurge family, is also valued for its wood, which is used for about the same purposes as the Asiatic teak-wood. The African wood, however, is the less durable. G.M.S.

Scientific Names. The Indian teak belongs to the family *Verbenaceae*. Its botanical name is *Tectona grandis*. The African teak is *Oldfieldia africana*, of the family *Euphorbiaceae*.

TEAL, teal. See DUCK.

TEAM WORK. See CHARACTER TRAINING, sub-head.

TEAPOT DOME. See HARDING, WARREN GAMALIEL (As President); COOLIDGE, CALVIN (Teapot Dome Investigation).

TEAR GAS. See POISON GAS.

TEASDALE, SARA (1884-), an American poet who has won the admiration of discriminating readers, because of the rhythm and purity of form of her lyric verse. She was born in Saint Louis, Mo., and educated there in private schools. Miss Teasdale has also traveled extensively. The quality of her work has shown no depreciation since her first volume appeared, in 1907. In 1914 she was married to Ernest B. Filsinger, of Saint Louis, but in 1929 they were divorced.

Her Writings. These include *Sonnets to Duse*, *Helen of Troy and Other Poems*, *Rivers to the Sea*, *Love Songs*, *Flame and Shadow*, and *Dark of the Moon*. She also edited *The Answering Voice—One Hundred Love Lyrics by Women*, and *Rainbow Gold, Poems Old and New Selected for Boys and Girls*.

TEASEL, te' z'l, the common name of a genus of plants containing one commercially

valuable species, the *fuller's*, or *clothier's*, teasel. This plant, which is native to the south of Europe and has been naturalized in America, is used to raise the nap on cloth. The parts employed for this purpose are the heads of the tubular pale-lilac or white flowers. These

heads are cut in two and attached to a cylinder which is made to revolve against the cloth. The largest heads are used for raising the nap on blankets; the next size, for raising that on cloth for men's garments. Small, immature ones are used for fine woollens and broadcloth. Strange to say, no mechanical device has ever been invented which satisfactorily fills the place of this plant. It is a thistle-like herb, with long, stemless leaves, prickly stems, and stiff, sharp bracts surrounding the flower heads. B.M.D.

Scientific Name. The species described is *Dipsacus fullonum*, family *Dipsacaceae*.

TECHNICAL AND INDUSTRIAL EDUCATION. The modern trend toward

the practical in education is seen in the establishment of vocational courses in the public schools and in the successful operation of numerous institutions which prepare young people to earn their livelihood. Technical and industrial education is a general term covering the various forms of instruction having this end in view. Such instruction is carried on in technical high schools, in manual-training classes, and in trade schools, and is continued in schools of applied science and technology of college rank. Among immature students, mistakes are often made, because these inexperienced young people do not always know for what vocations they are best fitted. What is being done to direct such students, and to help them choose vocations in which they will be successful, is



Photo: Visual Education Service

TEAK TREES
In the Federated Malay States.

told in these volumes under the heading VOCATIONAL GUIDANCE (Determination of Vocational Aptitudes).

TECUMSEH, *te kum' seh* (about 1775-1813), an American Indian chief, of Shawnee and Creek stock, was born near the site of the present city of Springfield, O. When about thirty-five years of age, he, with his brother



TEASEL (SEE PAGE 7052)

Tenskwatawa, known as "the Prophet," formed a great union or confederacy of Indian tribes, and about 1810 Tecumseh made a long trip through the present Southern states, to persuade the Creeks, Seminoles, and other tribes to join in the plan. He was a powerful orator, and his speeches during this journey are believed to have caused the Creek War of 1813.

While he was absent, his own tribe was badly defeated by General William Henry Harrison, in November, 1811, at the Battle of Tippecanoe, in Indiana; during the next year, the chief was appointed brigadier general in the British army, and he rendered valuable service against the Americans in the War of 1812. He was killed in the Battle of the Thames River, in Ontario, Canada. Tecumseh was a believer in the primitive virtues of the red man; he prohibited the use of intoxicants among his tribe, and did much to lead his followers back to the simple ways of their forefathers.

Related Subjects. The reader may consult in these volumes, for explanation of references and for further information, the following articles:

Harrison, William Henry
Indians, American (Shawnee)

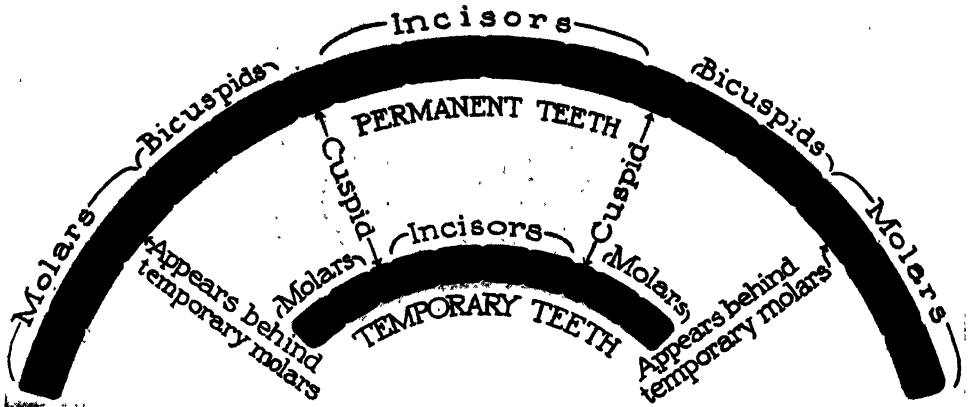
War of 1812 (Battles
of the War)

TE DEUM, *te de' um*, a famous Latin hymn, so called from the opening words, *Te Deum Laudamus* ("We praise Thee, O Lord"). Though one of the most solemn and majestic church songs ever written, it is also one of the simplest, and its words have inspired many composers to set them to appropriate music. The *Te Deum* is sung in Roman Catholic churches on occasions of rejoicing and thanksgiving, and it is found in the *Breviary* (which see) and in the Anglican prayer book, wherein it follows the first Lesson of Morning Prayer, unless the *Benedicite* is used in place of it. The authorship is unknown, but is ascribed by tradition to Saint Augustine and Saint Ambrose; now, more generally, to Nicetas, bishop of Remesiana, in Dacia.

TEETH. Like the hair and nails, the teeth are an outgrowth of the skin, the growth in this case taking the form of hard, shiny projections specially adapted for the work of cutting and tearing food, and of grinding it to a pulp. The tusks of the male elephant are really out-turned eyeteeth, the largest teeth possessed by any animal. The ant-eater (which see) has no teeth, but most vertebrates possess them. Man and most of the higher animals have two sets of teeth, a temporary and a permanent set. In the case of human beings, the first, or *milk*, set usually develops between the sixth and thirtieth months; and when the child is two and one-half years old, it has twenty teeth. At the age of five, the first of the permanent set begin to appear, but the last of these sometimes do not break through until the twenty-fifth year.

Names and Structure. There are thirty-two teeth in the permanent set of an adult, eight in each half of each jaw. In each half there are two incisors, one *canine* (called the *eye-tooth* in the upper jaw, because it is just below the center of the eye), two *bicuspid*s, and three *molars*. Because the last of the molars develop between the seventeenth and twenty-fifth years, they are called the *wisdom* teeth. The bicuspid's take the place of the temporary molars, but all of the permanent molars, twelve in number, are entirely new teeth.

Each tooth has three parts—the *crown*, that part seen in the mouth; the *root*, the part embedded in the jawbone; and the *neck*, or *cervix*, a narrowed portion between the crown and root. The jaw is furnished with sockets called *alveoli*, into which the teeth fit. The various kinds of teeth differ considerably in regard to the shape of the crown. That of an incisor is shaped something like a chisel, with sharp, horizontal cutting edges, for the incisors are used to bite or gnaw off the food. The canines (*dogteeth*) have thicker crowns, shaped somewhat like a cone, with a central point on



AVERAGE TIME OF APPEARANCE OF TEETH

The figures represent the age of the individual. [From a bulletin of the United States Bureau of Education.]

the cutting edge. In the case of dogs and cats, the canines are very long and pointed, for with them these creatures grasp and hold their prey. The bicuspid are not so long as the canines, and are somewhat cube-shaped. Each has an

is fixed in place by a thin layer of bone known as *cementum*, and at its tip is a narrow aperture, through which the blood vessels and nerves of the pulp cavity enter. Exposure to the air of these delicate nerves, through decay of the outer parts of the tooth, is responsible for the agonies of toothache.

Care of the Teeth. Because the inside of the mouth is always moist and warm, it is a very favorable breeding place for germs of all kinds. A neglected mouth may harbor organisms that cause diphtheria, pneumonia, and other infectious diseases. Furthermore, accumulations of food particles, collecting in the spaces between the teeth, at the margin of the gums and elsewhere, encourage the multiplication of countless bacteria, which form acids on exposed sur-

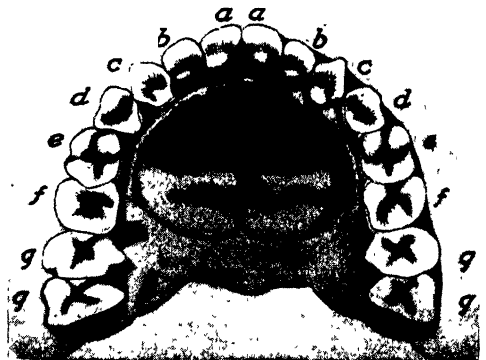


FIRST SET OF TEETH

(a) Central incisors; (b) lateral incisors; (c) cuspids; (d, e) temporary molars; (f) sixth-year molars.

inner and an outer point, or *cusp*, on the cutting edge. Hence the name, which means *two-cusped*. The molars, or grinders (*mill teeth*), are provided with large crowns, roughened in such a way as to adapt them to crushing and grinding the food. The molars of the upper jaw have three roots; those in the lower, two.

During the life of a tooth, a soft pulp, containing nerves and blood vessels, fills a cavity known as the *root canal*, which extends through crown and root. Immediately surrounding the cavity, and making up the greater part of the bulk of the tooth, is a hard, bony, yet elastic, substance called *dentine*. This is covered on the crown with *enamel*, a tissue so hard that it will strike fire with flint. The root of the tooth

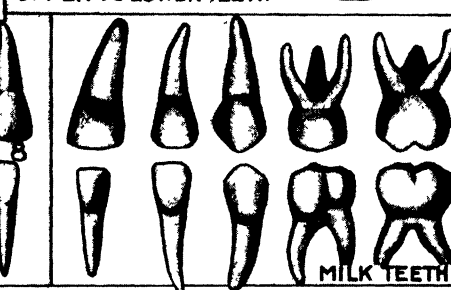
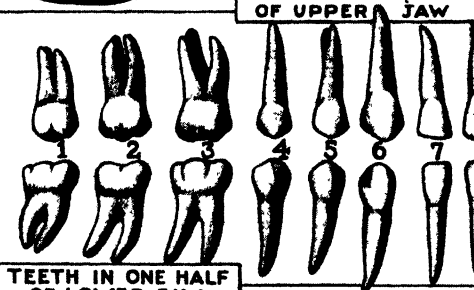
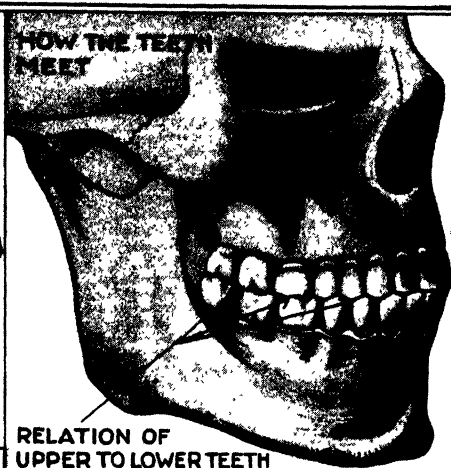
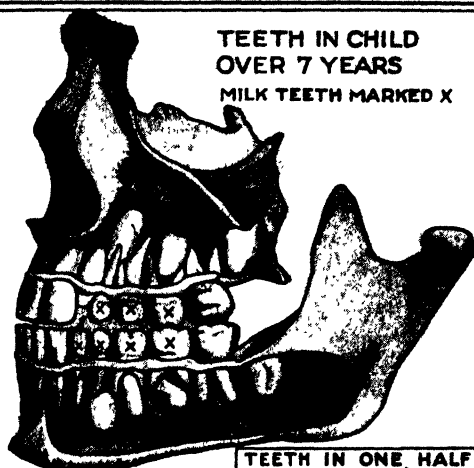


PERMANENT SET OF TEETH

(a) Central incisors; (b) lateral incisors; (c) cuspids; (d, e) bicuspids; (f) sixth-year molars; (g) molars.

faces of the teeth. These acids eat into the protecting enamel, and if no steps are taken to prevent further harm, ultimately cause the teeth to decay. For these reasons, the mouth and teeth should be scrupulously cared for,

TEETH *and* THEIR GROWTH

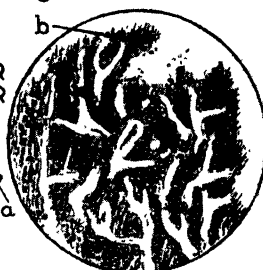


TEETH IN ONE HALF
OF LOWER JAW

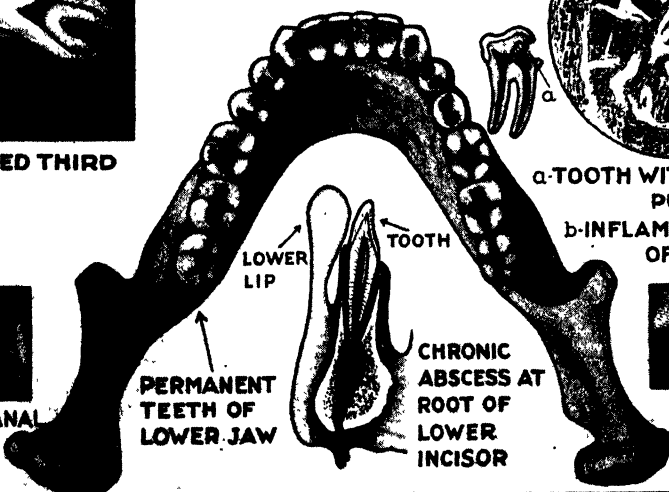


IMPACTED THIRD
MOLAR

- 1-3rd MOLAR
- 2-2nd MOLAR
- 3-1st MOLAR
- 4-2nd PREMOLAR
- 5-1st PREMOLAR
- 6-CANINE
- 7-LATERAL INCISOR
- 8-CENTRAL INCISOR

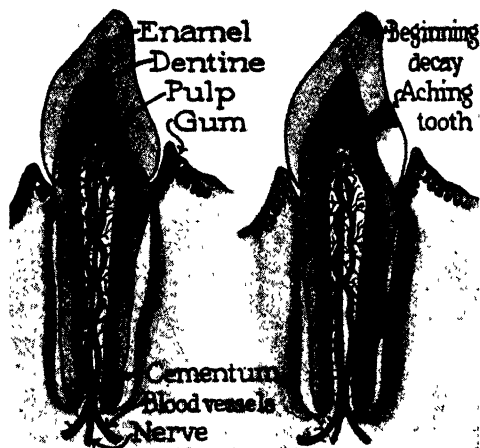


ROOT CANAL
FILLED
(X-RAY)



FILLED
TEETH
(X-RAY)

from infancy to the end of life. Parents who think the temporary teeth need no attention are badly in error. The first teeth of the small infant should be cleaned, at least twice a day, with a soft brush, and just as soon as the child is old enough to handle a brush, he should be



AN INCISOR

Diagram, at left, shows the principal structural parts. At right, the beginning of decay and the point at which pain is ultimately felt; the latter occurs when the process of decay has reached the pulp.

taught to perform this hygienic act for himself. Neglected teeth in the mouth of a little child are a source of physical pain and a detriment to thorough chewing and to the general health, and they have an adverse effect on the teeth which come later.

Not only should the teeth be thoroughly scrubbed, but the gums and back of the tongue also need daily cleansing. In addition to a good, moderately stiff brush, one should have in the toilet equipment a reliable tooth paste or powder, and an antiseptic mouth wash. Advice on these matters is always cheerfully furnished by the family dentist, who should be visited at least twice a year by each member of the family. The custom of brushing the teeth sidewise has fallen into disfavor, as this method lacks thoroughness. Instead, the brush should be placed upon the gum and manipulated with a rotary movement, upward on the lower teeth and downward on the upper. The teeth should be cleaned on the inside and out, and back to the last molars, and the mouth rinsed by forcing water between the teeth. If possible, a brushing should be given after each meal, but under no circumstances should one omit it at night, before retiring. If such precautions are taken, and the teeth are cleaned and examined twice a year by a reliable dentist, decay of these important organs can usually be prevented, or at least materially checked.

Aside from neglect of the mouth, unhygienic habits of eating may affect the teeth. The custom of bolting the food, or of including too great a proportion of soft and partly digested foods in the diet, interferes with that vigorous exercise of chewing so essential to the health of the teeth. The diet should be one that requires considerable mastication, and it may well include such acid fruits as apples, oranges, and grapefruit, all of which tend to keep the teeth clean. Another deplorable habit is that of breathing through the mouth, which causes dry, unhealthy gums. This is often due to enlarged tonsils or adenoids, and mothers and teachers everywhere should be on the watch to detect these conditions. It should be borne in mind that bad teeth are often a cause of disease elsewhere in the body, for cavities due to decay are a possible source of infection.

Preventive dentistry also emphasizes the importance of a tooth-building diet for the mother, before the birth of her child. The child whose mother has eaten proper amounts of milk, leafy vegetables, fresh fruit, butter, eggs, and whole-grain cereals is quite likely to have strong teeth. K.A.E.

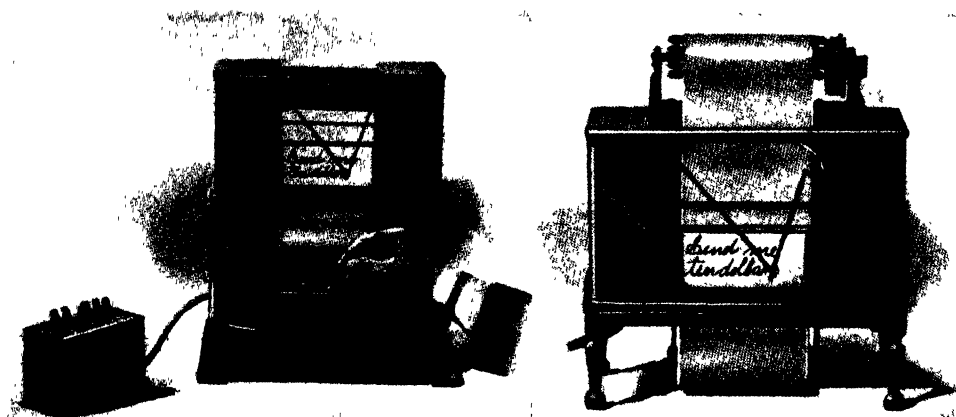
Related Subjects. The following articles in these volumes may be consulted in connection with the study of the teeth:

Adenoids	Life Extension
Dentistry	Mastication
Digestion	Mouth
Education (Hygiene)	Pyorrhoea

TEGNER, *leg' nair*, ESALAS (1782-1846), a Swedish poet, born at Kyrkerud. He was educated at the University of Lund, Sweden, where he served first as a tutor and lecturer, and later as professor in Greek, until his appointment as bishop of Vexjö, in 1824. His first success as a poet came in 1808 with the writing of a stirring war song. Three years later, he was crowned by the Swedish Academy for his patriotic ode *Svea*. During this same year, he founded the Gothic League of Sweden, for the study of old Scandinavian history and literature, and to its magazine he contributed some of the best of his critical discussions and verses.

In 1817 he wrote his famous *Song to the Sun*, and the outside world began to discuss him. Later appeared his three masterpieces: the romance *Axel*; the delicate idyll, or pen picture, entitled *The First Communion*, translated in later years by Longfellow; and the poem which Goethe called "the old, mighty, gigantic, barbaric epic," *The Story of Frithjof*, based upon ancient legends of Northern Europe, and by far the best-known of all Swedish writings. During the next fifteen years, Tegner's mind became unsettled by an unhappy love affair, and he did no more work of importance.

TEGUCIGALPA, *tay goo se gal' pah*, capital of Honduras (which see).



HOW HANDWRITING IS TRANSMITTED BY ELECTRICITY

The telautograph sending station is shown at the left; the writer can see his message exactly as he forms it with the writing instrument. At right, the message coming in at the receiving station.

TEHACHAPI MOUNTAINS. See CALIFORNIA (Surface Features).

TEHERAN, *teh h'rahn'*. See PERSIA (The Cities).

TEHOKHONDO, MOUNT. See STANOVOL MOUNTAINS.

TEHUANTEPEC, *tay wahn tay pek'*, ISTHMUS OF, the narrowest portion of Mexico, comprising that part of the country lying between the Gulf of Campeche, an arm of the Gulf of Mexico, and the Gulf of Tehuantepec, a part of the Pacific. It includes the southeastern parts of the states of Vera Cruz and Oaxaca, and small districts of Chiapas and Tabasco. The isthmus is 120 miles from north to south at its narrowest point; its mountains are broad and low, and for five hundred years it has been suggested as an interoceanic route for a railway or canal. In 1907 a railroad 192 miles long was completed; it extends from Puerto Mexico, on the Atlantic, to Salina Cruz, on the Pacific. There is a branch from Juile to San Juan Evangelista, eighteen miles in length, and connections may be made with the Vera Cruz & Pacific Railway, from Santa Lucrecia. Four days may be saved in routing a cargo from New York or London over the Tehuantepec Railway, instead of through the Panama Canal, and electric machinery is provided at the docks for loading and unloading. R.H.W.

TEJU, *teh yoo'*, the common name of a family of large, powerful lizards, found in South and Central America, the West Indies, Mexico, and the Southwestern United States. There are over a hundred species, the largest being three feet long, including the tail. This teju is bluish-black above, with crosswise yellow stripes, and reddish-yellow below. The tejus live in burrows, and feed on small animals. They are very swift and agile. The species described above is *Tupinambis teguixin*.

TELAUTOGRAPH, *tel aw' toh graf*, an instrument for transmitting writing by electricity. A facsimile of what is written or drawn on the transmitter is instantaneously reproduced and recorded by receiving instruments at one or more stations, each of which is connected to the transmitting station by two lines of wire carrying an electric current.

The machine is about as wide as an ordinary typewriter, and somewhat taller. It is placed on a desk or table, in a position convenient for the hand. The metal writing stylus resembles an ordinary lead pencil, and has two silk cords, attached near the point and connected with the transmitter. By its movements over the metal plate, the stylus sends varying currents through these cords and over the line wires connected with other stations, which electrically operate the distant receiving pens. These pens reproduce the same motions, thus duplicating the writing. The receiving pen is a modification of an ordinary drafting pen, and is moved by supporting arms connected with the live wires. When not in use, the pen rests with its point in an ink bottle fixed at the side of the plate over which the recording paper passes.

The telautograph is one of the most useful and accurate of all efficiency machines. It transmits a message with speed and exactness, and is invaluable for recording and comparing signatures in banks. It is extensively used in hotels, department stores, and other large business establishments, to send messages to various rooms or departments, and is very useful in noisy places, where the use of the telephone is difficult. This instrument is also utilized for writing messages on bulletin boards, visible to large crowds of people, such as gather on election days when political feeling runs high. It was invented by Elisha Gray (see his biography, in these volumes).



The STORY of the TELEGRAPH

TELEGRAPH, *tel' e graf*, a device that ranks as one of the greatest civilizing agencies the world has ever known. It has revolutionized the means of communication. It has brought widely separated nations into the relationship of near neighbors, making them rapidly acquainted with the arts of peace, and as thoroughly serving them in the business of war. Combined with radio, it has increased man's avenues of communication beyond anything dreamed of a generation ago. The telegraph is a device for sending messages to a distant place by means of signals which represent words or ideas, as distinguished from the telephone, in which spoken words are reproduced at a distance. The word *telegraph* means *to write afar off*. The electromagnetic telegraph has displaced all other forms; hence the word is now understood to mean a device in which electricity is used in the transmission of signals to a distance.

The Speed of Telegraphy. "As quick as a wink" is a homely phrase for instant action, but only in the telephone and radio communication has human effort matched the telegraph for instantaneous effects. A telegraph operator presses his key in New York City; when his instrument clicks, in response to that pressure, a sounder at the other end of the line in San Francisco will at almost the same indivisible fraction of a second respond to the impulse that has traveled the breadth of a great continent. When Queen Victoria died, papers announcing her death were selling on the streets of American cities thirty minutes after the event, and before the slower English editors had printed the same information. The result of a horse race in Havana is known to thousands of sportsmen in all sections of America before the winning horse is led off the track. In early colonial days, a Bostonian wishing to get word to a man in New York might be able to journey back and forth in possibly twenty days. To-day, he can lift his telephone receiver, ask for the telegraph company, and then dictate his message to the waiting operator, who writes it immediately on a noiseless typewriter; or he can call a

messenger boy electrically, send a telegram, and, barring human delays, get an answer in about as many minutes, at a cost of a few cents. At daylight, on a morning in July, 1917, the English exploded a dozen mines at Messines, Northern Belgium, which they had planted under the Germans. Before daylight, across the western sea, papers containing the news were being delivered to their readers.

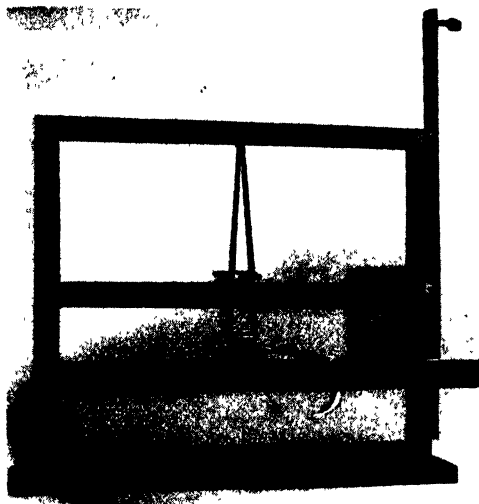
Such facts as these proclaim the marvel of the telegraph. Because of it, "a girdle can be put around the world" in a few minutes, and the news of feast or famine, coronation or death, in India, becomes a theme for congratulation or sympathy in an hour, in the Western world. A telegram has reached Sydney, Australia, from New York City, by direct wire, in three seconds—an electrical impulse pushed through twelve thousand miles of resisting wire, over mountains and under oceans, in about the time you need to walk a few feet.

Development. The first message over the telegraph wire, between Washington and Baltimore, in 1844, was "What hath God wrought!" The marvel of that crude first instrument, the invention of Samuel F. B. Morse, suggested powers almost supernatural, yet man has taken these physical forces, which even yet he understands only in part, and has employed them to carry his message to the uttermost parts of the earth.

To accomplish this, he has demanded almost 6,500,000 miles of wire for his telegraph and submarine cables—enough wire to stretch 260 times around the world. Of the land lines, the United States possesses about 2,020,000 miles of wire, or practically one-third of the lines of the world; Canada has over 305,900 miles. The total land-telegraph investment of the world, including wires, offices, and all equipment, is approximately a billion dollars, a great sum to be applied to an invention which was unknown within the memory of men yet living, and which is yet a novelty in many thickly settled countries.

When Samuel F. B. Morse invented the telegraph, it is doubtful if he realized the wide use to which his invention would ultimately

be put. To-day, the transmission of telegrams is but one feature of the business of the world's largest telegraph company. In addition to handling messages, money is now sent telegraphically; photographs are sent over the



wires; facsimile messages, in one's own handwriting, are transmitted at a relatively cheap cost to the sender; the correct time is given hourly to thousands of persons by telegraph; and the nation's festive days are celebrated, in large part, by the widespread transmission of greeting telegrams, delivered on colorful blanks at no extra cost.

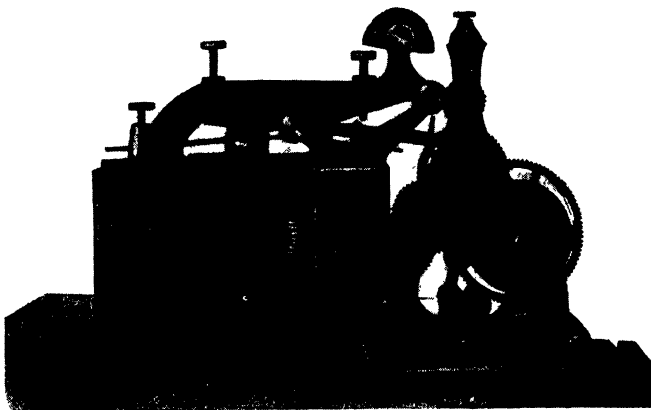
While the early telegraph was considered a marvel of speed, it cannot compare with the more modern equipment and instruments in use to-day. The manual method of telegraphy, by which dots and dashes were the medium of communication, has been replaced, to a very large extent, by a more modern method of automatic telegraphy. In fact, more than three-quarters of all the telegrams handled in the United States to-day are sent and received automatically. The automatic method conduces to greater speed and accuracy, for one thing. Moreover, operators can be trained more rapidly and easily for this method of telegraphy.

Printing Telegraph. The Simplex automatic telegraph-printer and the Multiplex automatic telegraph-printer are the two machines principally employed to handle the bulk of the

nation's telegraphic business to-day. The Simplex machine, in appearance, is not unlike the conventional typewriter. The operator, to send a message, merely types it out on the keyboard. On the ordinary typewriter, the keys and type bars are connected mechanically. On the Simplex printer, the connection is electrical rather than mechanical. Therefore, when an operator in New York, for example, presses the letter "E," the same letter is printed in a matter of seconds in Chicago. On the receiving end, the message comes out on a paper tape, which is then pasted on a telegraph blank. See illustration, page 7062.

The Multiplex printer operates in a somewhat similar manner, but with this machine the depression of the key by the operator causes perforations to be made in a strip of paper, which is then fed into an automatic transmitter, from which the signals are sent flashing over the wire. The use of automatic devices to handle telegrams marks one of the greatest advances in the history of telegraphy, and has put this business on a higher plane of efficiency than ever before.

Indeed, to-day, many steps in the handling



Photos: Western Union Telegraph Co.

THE FIRST MORSE RECORDERS

Above, the recorder built by the inventor of the electric telegraph in 1835. Below, an improved recorder, the one on which was received the first public message, "What hath God wrought!"

of a telegram are automatic. Not only is the telegram itself sent over automatic machines, but pneumatic tubes carry it from branch offices of the telegraph companies in large cities to the main operating quarters, and automatic belt-conveyors take the message to the proper sending operator and help to speed it on its way, to cite but a few of the automatic steps in use.

Probably one of the most important tasks performed by the telegraph company of to-day is the transmission of stock and commodity quotations. The stock quotations from the

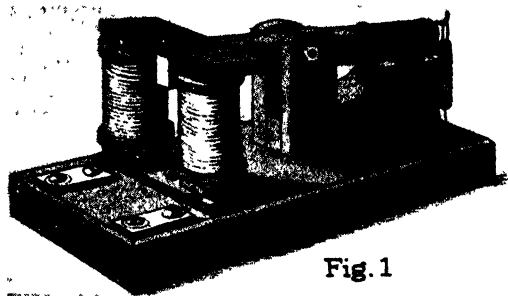


Fig. 1

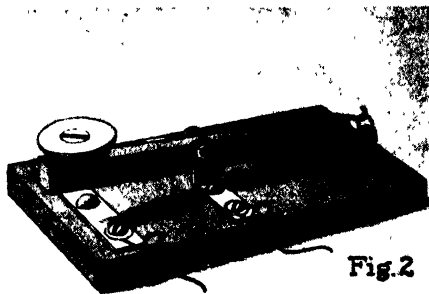


Fig. 2

A BOY CAN MAKE A SIMPLE SOUNDER AND KEY

financial center of New York are sent by the telegraph company to the four corners of the earth. When a broker on the floor of the New York Stock Exchange makes a sale, this sale and the price at which the stock is sold are recorded at the telegraph company's headquarters in New York City. Here it is retransmitted by an automatic machine to thousands of tickers in all sections of the country, so that to-day the investor in Oshkosh can keep in as active touch with the stock market as the broker in Wall Street. In like manner, the telegraph carries quotations on cotton to the entire world, from such cities as New Orleans and Galveston, and submarine cables bring to interested persons or firms in America quotations on copper, lead, silver, and other metals; land-line telegraphs also transmit

quotations on such a variety of commodities as livestock, resin, turpentine, butter, eggs, and poultry.

Newspaper Service. The telegraph is probably the newspapers' best friend, for it enables the large daily, as well as the small town weekly, to obtain the news of the world before this news has grown stale. Giant press associations, whose news-gathering facilities cover the earth, disseminate by telegraph the news they have gathered. You can pick up your morning paper in San Francisco and learn what has happened the day before in London, New York, Chicago, Philadelphia, Shanghai, Buenos Aires, or Paris. While you have been sleeping, the telegraph has been carrying the news of the world to thousands of papers.

Pictures by Wire. See TELEPHONE, subhead.

The Principle of the Telegraph

Telegraph and Doorbell Compared. An electric doorbell circuit is similar to a telegraph circuit. When a caller arrives at the door, he telegraphs the fact of his arrival by means of the electric bell. The bell corresponds to the telegraph sounder. The push button at the door corresponds to the telegraph key. If two wires are connected to an electric battery and to an electric bell, the bell rings, because the current from the battery flows through the coils of the electromagnet, which is part of the bell. If one of the wires is cut, and the ends are separated, the bell ceases to ring, because the circuit is open and the current cannot flow. If the ends of the cut wire are pressed together, the bell again rings.

Since it would be inconvenient to press the ends of two wires together every time one wished to ring the bell, a push button is used, the end of one wire being connected to a spring, and the end of the other to a second spring under the first. When the button is pressed, the two springs are pressed together, and this is the same as pressing the ends of the wires together. Pressing the button causes the bell to ring, because this closes the circuit and permits the current from the battery to flow through the bell. See ELECTRIC BELL.

In the telegraph, pressing the key closes the circuit and permits a current to flow through the electromagnet coils of the sounder. The electromagnet then pulls a piece of iron called an *armature*; it pulls only when a current is flowing through the coils of the magnet. When the key at the sending station is pressed down, it makes an electrical contact which closes the circuit and permits a current to flow through the electromagnet coils of the receiving instrument. The electromagnet then attracts the iron armature, pulling it down, and with it the brass arm of the sounder. This causes a click. When the key is released, the circuit is broken, the current ceases in the electromagnet, the sounder arm is released, and the spring pulls it up, causing a second click.

A Simple Telegraph. Two boys can easily set up a telegraph line between their homes. Two sounders, two keys, and one electric battery, which may consist of two or three dry cells, are needed. The magnet of an old electric bell can be used in making the sounder, or an electromagnet can be made, as follows:

With a hack saw or a file, cut off two pieces of soft-iron rod, each about an inch and a half long, and file the ends smooth. Cut out two round discs of hard fiber or stiff cardboard, and

Old and New methods of COMMUNICATION



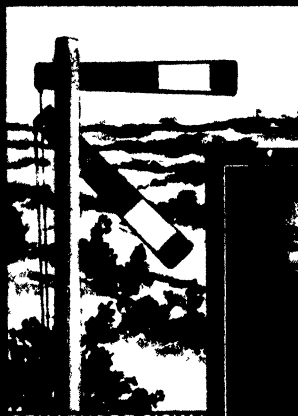
INDIAN SMOKE SIGNAL



BEACON



SAVAGE DRUM SIGNAL



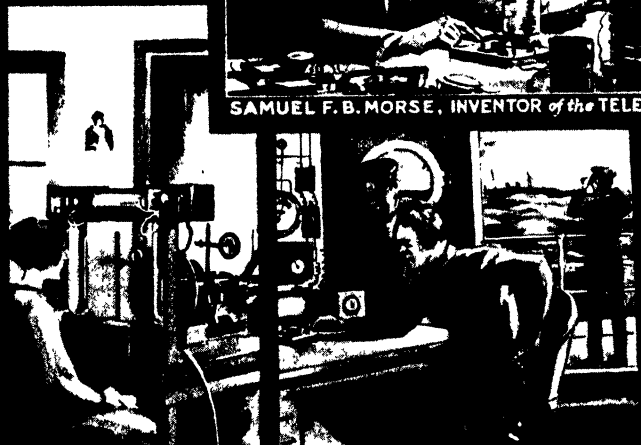
SEMAPHORE SIGNAL



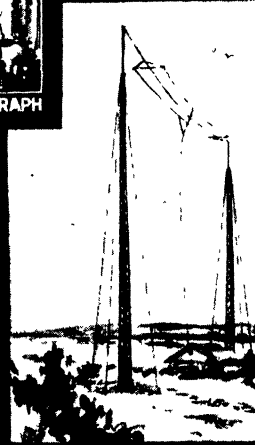
SAMUEL F. B. MORSE, INVENTOR of the TELEGRAPH



HELIOGRAPH



TELEVISION



WIRELESS SENDING STATION

WIRELESS ABOARD SHIPS

fit them to the ends of the iron rods, so as to form spools. Wind about fifty turns of magnet wire on each rod, winding the two coils in the same direction. The two coils are to stand upright on the base of the instrument, and to rest on a strip of iron. It is better if the strip of iron can be fastened to the rods with machine screws, but this is not necessary. Connect the coils so that, when connected to a battery, the upper end of one rod is a north pole and the upper end of the other is a south pole. The polarity can be tested by means of a pocket compass. Another strip of iron is used for the armature of the magnet. This armature is fastened to an arm of brass or wood. The arm is pivoted, and held up by a rubber band or by a spring made of brass or steel wire. The sounder then appears as in Fig. 1.



Photo: Western Union Telegraph Co

THE SIMPLEX PRINTER

A key for opening and closing the circuit can be made of a piece of spring brass or spring steel, or an ordinary bell push button can be used. The key will then appear about as in Fig. 2. Only one line wire is needed. For the ground connections, connect the wires to gas or water pipes. A key and sounder like that shown on page 7060 may be bought for less than five dollars.

The Relay. For long-distance work, the current from a battery, or even from a dynamo, is



Photo: Western Union Telegraph Co.

MODERN KEY, SOUNDER, AND RELAY

too feeble to operate the sounder. This is true, because of the resistance a long-line wire offers to the passage of the electric current. The practical limit of the single telegraph line in fair

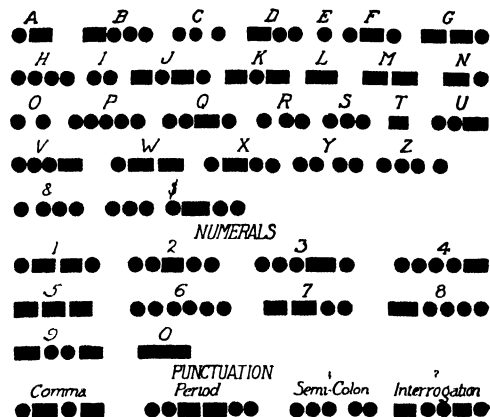
weather is about 450 miles; in rainy weather, the limit is from 150 to 250 miles. However, messages are sent in all kinds of weather over distances of thousands of miles. This is accomplished by means of a *relay*. A relay is a contact key which is operated by means of an

electromagnet. It is operated in the same way as a sounder. Suppose that, when the armature of a sounder is pulled down by the magnet, it brings two contacts together and closes another circuit. The sounder would then be a relay. The circuit which is closed by the relay may be hundreds of miles long, or it may be only a few feet. A relay used in this manner to send a message on to a more distant station is called a *repeater*. At the farther end of the second line, there may be a second relay which closes a third circuit. A message may be sent to any desired distance,

by the use of a sufficient number of relays.

The Codes. There are two codes in general use, the Morse and the Continental. The Morse code is used in the United States and Canada, and the Continental code has been adopted in all other countries. For communication by cable between the United States and other nations, the Continental code is used. The signals of the Continental code consist of dots and dashes; those of the Morse code consist of dots, dashes, and spaces. The letters which occur most frequently have the simplest symbols; for example, the letter *e* is represented by one dot, and the letter *t* by one dash, in both systems. A dot is made by quickly pressing and releasing the key, producing a rapid *click-clack* sound in the receiver. A short dash is twice as long as a dot. A long dash, as for the letter *l*, is equal to four dots. The space between the dots and dashes that make up a letter is equal in length to the dot. The space between the letters of a word is equal to three dots, and the space between words to six dots. A space which is part of a letter combination is equal to two dots.

Sending Four Messages at One Time Over One Wire. One of the marvelous achievements in telegraphy is that of sending a number of messages at one time over one wire. One



THE MORSE CODE

Dots, dashes and spaces are employed to form the letters.

electric current can be made to convey four messages simultaneously, two going in one direction and two in the opposite direction, and the messages do not interfere with each other. To send two messages at one time in opposite directions, the instruments must be so arranged that the sounder is in the circuit, but is not affected by the sending instrument at the same station.

A telegraph system by means of which two messages can be sent at one time is called a *duplex system*. In the duplex system, the making and breaking of the circuit operates the sounder, regardless of the direction in which the current flows. In another system of duplex telegraphy, it is by changes in the direction of the current that the signal is transmitted. When these two systems are combined in one wire, a single current will transmit four messages at one time, developing a *quadruplex*, or fourfold system. We may think of the fourfold system as working in the following manner:

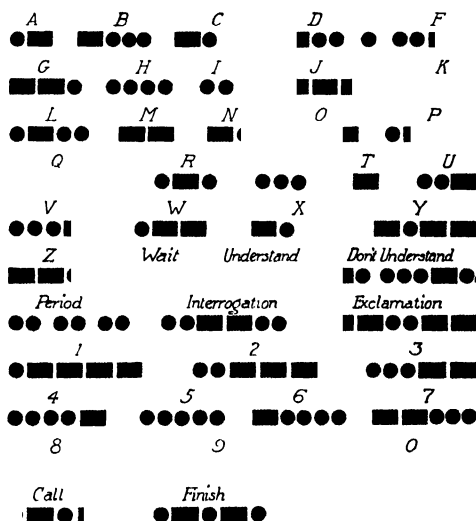
There are two receivers and two sending instruments at each end of the line, all connected to one line wire. They are so arranged that the outgoing messages from station 1 do not affect the receiving instruments at station 1. Messages sent from station 1 affect only the sounders at station 2. A constant current is flowing in the line, but the receiving instruments are so arranged that none of them is moved by this current, unless a change is made either in the direction or the strength of the current. If the direction of the current is changed at station 1, one sounder at station 2 responds with a click, but the other sounder at station 2 is not affected. If the strength of the

current is changed at station 1, the second sounder at station 2 responds. Thus two signals are sent at the same time from station 1 to station 2. In the same way, and at the same time, two signals may be sent from station 2 to station 1.

It is also possible, by attaching four machines to each end of a line, to send eight messages, four in each direction, over a single wire at the same time. This is the multiplex system. By means of an automatic-control device, the sending and receiving operators can instantly communicate with each other, should it become necessary during the transmission of a message. In case of necessity, an automatic circuit may be converted into a manual or Morse circuit, simply by turning a switch.

The multiplex system is ideal for lines between important centers where traffic is heavy and constant, but because of the relatively high initial cost, and the necessity for expert supervision, it is not so well suited to other circuits. The simplex system is widely used for circuits carrying a limited amount of traffic.

Use of the Dynamo. For long-distance telegraphy, dynamos are used to supply current to the line. They occupy less space and are more economical than batteries. A generating plant



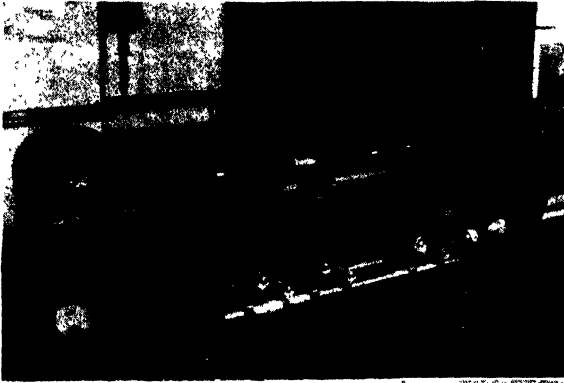
THE CONTINENTAL CODE

Dots and dashes are employed to form the letters. Spaces are used only to indicate the end of one letter and the beginning of the next.

sufficient to operate a thousand lines may be installed in a small room. The lines may vary in length from 50 to 500 miles.

Batteries. When batteries are used for long-distance work, storage cells are always used. The gravity, or Daniell, cell is used for local

circuits only, and even for local circuits, storage cells are frequently used.

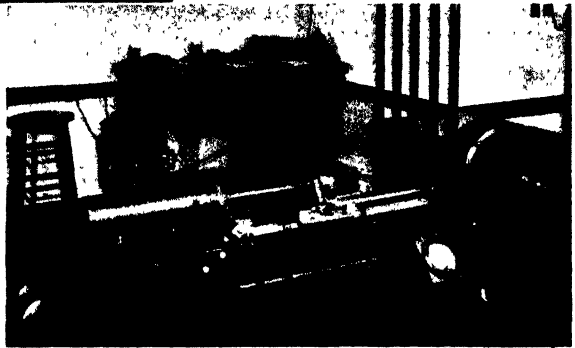


Photographs by Telegraph. The transmission of photographs by wire, over established telegraph lines, is in one sense a development of the facsimile systems of telegraphy, including the writing telegraphs, such as Elisha Gray's telautograph (which see). The method of sending photographs by telegraph, however, is more correctly described as a system of telephotography. The picture to be transmitted, say, from New York to Chicago, is specially prepared by a photographic process, and is then exposed bit by bit—that is, a small area at a time—to a transmitting device which varies the line current according to the depth or

intensity of the shading in the picture area exposed. In the receiving device, at the other end of the line, similar small areas of sensitized paper are concurrently exposed, during the process of transmitting the photograph; and the degrees of shading in the original picture, controlled by the variations in the live current, are reproduced by similar discolorations of the sensitized paper. Thus, as one small area after another is exposed to the transmitting device, the contrasts of the original picture are reproduced at the receiving end.

Telegraphing without Wires. See RADIO COMMUNICATION.

Submarine Telegraph. See CABLE, SUBMARINE.



Photos Western Union Telegraph Co.

PHOTOGRAPHS SENT BY TELEGRAPH

Above, the sending apparatus; below, the receiving machine.

Historical Sketch

A telegraph consisting of a system of semaphore signals was used in the latter part of the eighteenth century. France had the most extensive system of this kind, connecting Paris with all the principal cities of the country, a semaphore every three miles. In those days, the device was considered wonderful, as indeed it was.

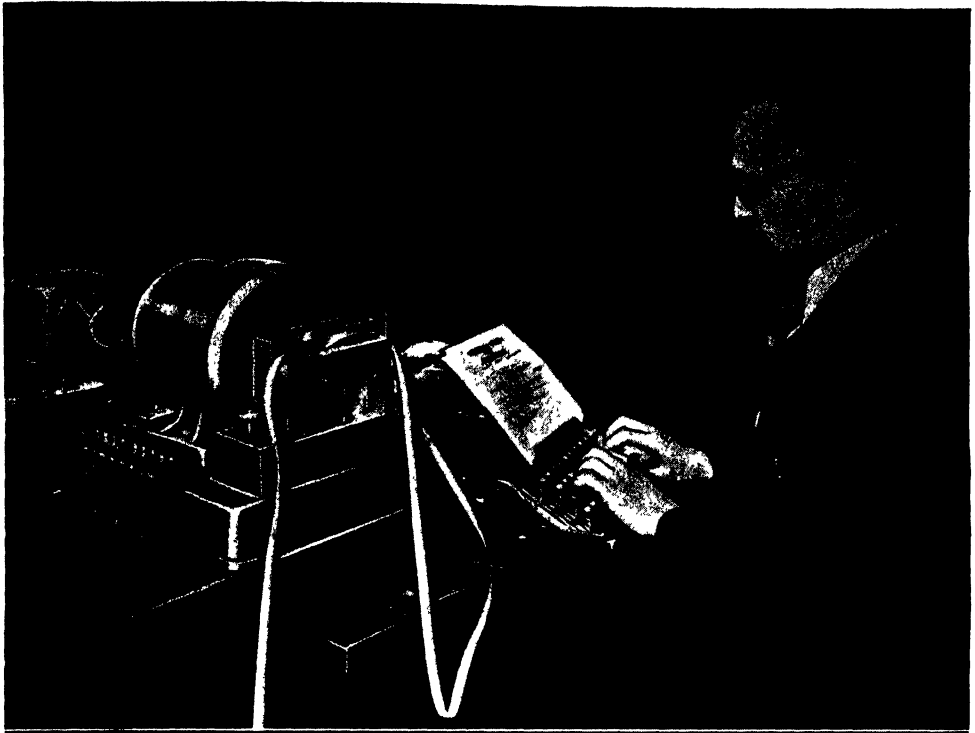
Benjamin Franklin was the first to conceive the idea of telegraphing by means of electricity, and to leave a record of his experiments. He tried the experiment with four miles of wire, but the electric battery was then unknown, and the discharge from an electrical machine or a Leyden jar could not be used for a practical telegraph.

The timely invention of the electric battery in the last year of the eighteenth century revived the idea of an electric telegraph. Every known means of producing an electric current or a static electric charge, and every known effect of an electric current up to the time of Morse's invention, had been used in attempts to invent a telegraph. No success

was possible, however, until the electromagnet had been discovered and perfected. This discovery was made by Sturgeon, in 1825, but for some time it remained a crude device.

The discovery (1820) of Hans Oersted (1777-1851), a Danish physicist, that an electric current flowing along a wire will cause a compass needle to turn, when the wire is held in a certain position over the needle, led to the invention of the needle telegraph. In the needle telegraph, the receiver was simply a magnetic compass placed in a coil of wire. When the circuit was closed at the sending end, the needle moved; the movements of the needle indicated the letters of the alphabet. A number of needle telegraphs were invented, and some of them were used commercially. The Cooke and Wheatstone needle telegraph was employed in England as late as the year 1870, but it was not successful over long distances.

The device that made long-distance telegraphy possible is due to Joseph Henry, whose discovery consisted of a means of increasing the strength of an electromagnet by winding



Photos: Western Union Telegraph Co.

Sending and Receiving a Cablegram. Above, the operator is sending a message over an Atlantic cable. Below, on the other side of the ocean another operator is receiving it from the siphon-recorder. He reads the wavy line, and copies the message on a typewriter.



Photo: Western Union Telegraph Co

STEAMSHIP "GREAT EASTERN" LAYING THE ATLANTIC CABLE

From a poster made at the time of the laying of the first successful cable between the United States and Europe. The portrait is that of Cyrus W. Field. [See CABLE, SUBMARINE.] Thus the telegraph began to find its way around the world.

many turns of insulated wire upon the coil, so that even a feeble current would produce considerable magnetic strength. Samuel F. B. Morse (1837) made use of the discovery of Henry, and devised a practical system which was the beginning of the modern telegraph.

Morse had difficulty in convincing men of the value of his invention. Private investors would not give him a hearing, and he despaired until, finally, the United States government appropriated \$30,000 for a test. A line was built from Washington to Baltimore, but even the Congressmen who voted the money for the experiment ridiculed the inventor and his device. The first words sent over this line, quoted previously in this article, were suggested by a young lady who was present at the epoch-making experiment.

The Democratic national convention was then in session at Baltimore. A Senator named Wright was nominated for Vice-President the following day; the news was telegraphed to Morse in Washington, and he advised the

nominee of the honor. Wright said, "Tell them that I refuse the nomination." Not realizing that a new force had been demonstrated to the world, and failing to see how the declination could have come so quickly from Washington, the friends of the nominee believed the story to be an invention of the opposition. They accordingly sent a delegation to visit him, and there learned the means by which his refusal had reached Baltimore. On the following day, James K. Polk was named for President of the United States, and the fact was published briefly in a Washington paper, under the heading "Telegraphic News." This was the first incident of the kind in the world's history.

N.C.

Related Subjects. The reader will find interesting supplementary matter about telegraphy in these volumes, in the following articles:

Cable, Submarine
Dynamo
Electricity
Henry, Joseph
Morse, Samuel F. B.

Radio Communication
Stock Ticker
Telautograph
Telephone
Teletype

TELEGRAPH, WIRELESS. See RADIO COMMUNICATION.

TELEGRAPH PLATEAU. See ATLANTIC OCEAN; OCEAN (Bed).

TELEMACHUS, *te lem' a kus.* See ULYSSES; MENTOR.

TELEPATHY, *te lep' ah thee,* the influencing of one mind by another at a distance, without the use of ordinary means of communication. Telepathy rests upon clairvoyance (which see) for its foundation. The mind is aroused to action in two ways: by impressions received through the senses, and by intuition. The mind when acting upon impressions received through the senses is considered as the *objective mind*; when acting from intuition, the *subjective mind*. Telepathy is possible only when each mind concerned is in a subjective state. Furthermore, there must be a bond of sympathy between the persons.

Those who argue in favor of telepathy claim that when two people, A and B, are in the same room, the mind of one acts upon the mind of the other in such a way as to produce the mental results desired by A upon B, without any words, looks, or other visible means of communication. A good illustration of this is found in the old game of "Willing." A wills that B perform a certain act, and B complies without any visible sign of communication. The Society for Psychical Research, after extended investigation, decided that in most cases there is some means of communication which the observer is not able to detect, because when the persons are in separate rooms, the instances of success are no more than can be accounted for by chance. For instance, A wills that B write the number 10 on a card. There is a chance that A and B may be thinking of the same number, and that the number 10 will be written. On the other hand, there is a strong probability that they will not be thinking of the same number, unless there is collusion. The experiments referred to showed ninety cases of success with A and B in the same room, when chance should allow only eight. With A and B in different rooms, the instances of success were no more than could be accounted for by chance.

Those who accept the hypothesis of telepathy make use of it to account for warnings and messages from distant friends, in times of special stress or danger, and to account for other similar phenomena.

There is a wide difference of opinion concerning the validity of the hypothesis on the part of those who have given the subject careful study. Some reject the theory entirely, while others believe that some evidence in its favor is "tangible," though not sufficient to warrant a full acceptance of the hypothesis.

Relating to Various Beliefs. The articles on the following topics may be of interest in this connection:

Alchemy
Astrology
Clairvoyance
Conjuring
Demonology
Divination
Faith Cure
Hypnotism
Magic
Medium
Mesmerism
Mind Reading
Necromancy

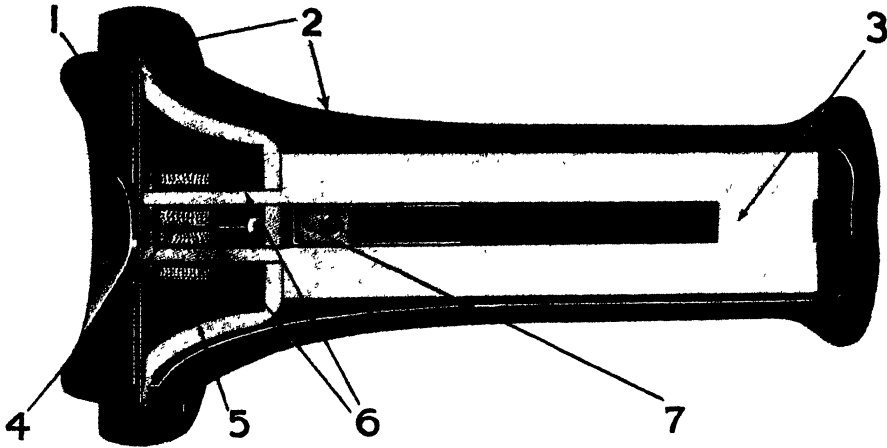
Occult
Palmistry
Phrenology
Physiognomy
Psychical Research
Psychoanalysis
Spiritualism
Subconscious
Suggestion
Superstition
Theosophy
Witchcraft

TELEPHONE, *tel' e fohn.* So perfect to-day is the instrument we call the telephone, that the voice of a friend, sent in normal tones over a thousand miles of wire, may be heard as distinctly and be as easily recognized as though the speaker were in an adjoining room, with open doors between. The transmission of the sound of the voice is almost instantaneous; while a word is being spoken into the transmitting device, it is at the same time being heard in a receiving instrument. Modest claims were made by the inventor, Alexander Graham Bell, in 1876, but nobody believed them; in a very few years, however, the device was the basis of one of the most gigantic enterprises the world has ever seen. So new is the telephone that millions of people who are still living can remember when they saw the first imperfect instruments.

A "Criminal" Enthusiast. Viewing the telephone to-day as a vital element in communication, and no longer as a new and startling invention, we can scarcely believe that a man who possessed vision was branded as a criminal in 1875—one year before the telephone became a reality—because he tried to raise funds to promote a machine which would carry the human voice over a wire. Such an incident became part of the recorded history of the telephone when a prominent Boston daily newspaper published the following article (June, 1875):

A man about 46 years of age, giving the name of Joshua Coppersmith, has been arrested in New York for attempting to extort funds from ignorant and superstitious people by exhibiting a device which he says will convey the human voice any distance over metallic wire, so that it will be heard by the listener at the other end. He calls the instrument a "telephone," which is obviously intended to imitate the word "telegraph" and win the confidence of those who know of the success of the latter instrument without understanding the principles on which it is based.

Well-informed people know that it is impossible to transmit the human voice over wires, as may be done with dots and dashes and signals of the Morse Code, and that, were it possible to do so, the thing would be of no practical value. The authorities who apprehended this criminal are to be congratulated, and it is hoped that his punishment will be prompt and fitting, that it may serve as an example to other conscienceless schemers who enrich themselves at the expense of their fellow creatures.



LONGITUDINAL SECTION OF MODERN TELEPHONE RECEIVER

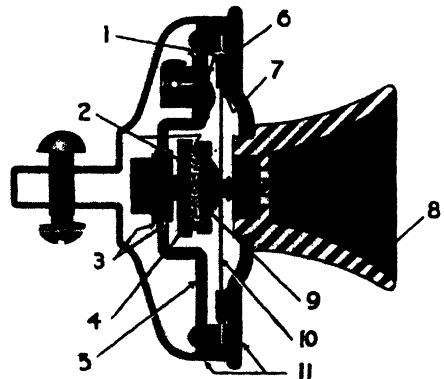
(1) Diaphragm of ferrotypc iron, japanned to prevent rust; the separation between diaphragm and pole pieces held to close limits. (2) Case and cap, of highest-grade hard rubber. (3) Welded magnet, of special selection of magnet steel. (4) Removable form-wound coils. (5) Brass cup, airtight. (6) Pole pieces of high-grade magnetic iron, welded to magnet; the ends are lacquered, to prevent rust. (7) Concealed binding posts.

Description of the Modern Telephone

A number of devices for reproducing the sounds of the voice have been tried, but the first one that proved successful for practical use was the electric telephone. In the modern electric telephone, a fluctuating current flows along the line wire. In the receiver at the far end, the fluctuating electrical current is reconverted into sound. Sound travels in copper wire with a speed of about two miles per second; if it were the sound which traveled over the telephone line, it would require a thousand seconds, or more than sixteen minutes, to receive an answer to a spoken message over a line a thousand miles in length, since it would require five hundred seconds for the message to travel each way. The telephone does not transmit sound; it transmits an electric current which is transformed or translated into sound (see illustration).

The Receiver. The telephone receiver consists of a horseshoe-shaped steel magnet having coils of fine wire around the ends, and near the ends a diaphragm of soft iron, held in place by a hard-rubber casing. When an electric current flows through the coil in the receiver, a strong current produces a strong magnetic field; a weaker current, a weaker magnetic

field, vibrating. When the magnetic pull is stronger, the disc is pulled inward; when the pull is weaker, the disc is released. The disc in the receiver is thus made to vibrate the same



LONGITUDINAL SECTION OF TRANSMITTER

(1) Hard-rubber insulator. (2) Carbon electrodes. (3) Mica insulators. (4) Granular carbon. (5) Galvanized steel bridge. (6) Waxed paper. (7) Rubber insulator. (8) Electrose mouthpiece. (9) Mica diaphragm. (10) Aluminum diaphragm. (11) Brass, nickel-plated.

Since the current which flows over the telephone line wire from the transmitter is fluctuating, the magnetic field is alternately strengthened and weakened. The repeated changing of the magnetic force sets the diaphragm, or

number of times per second as the disc in the transmitter; for every vibration of the transmitter diaphragm, there is produced a similar

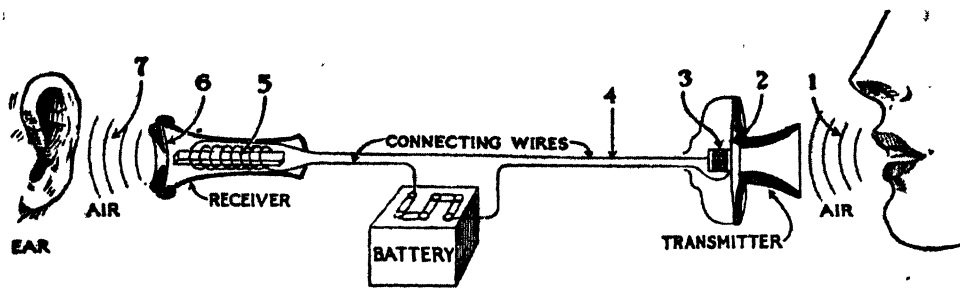


Photo: American Telephone and Telegraph Co.

SIMPLEST TELEPHONE CIRCUIT

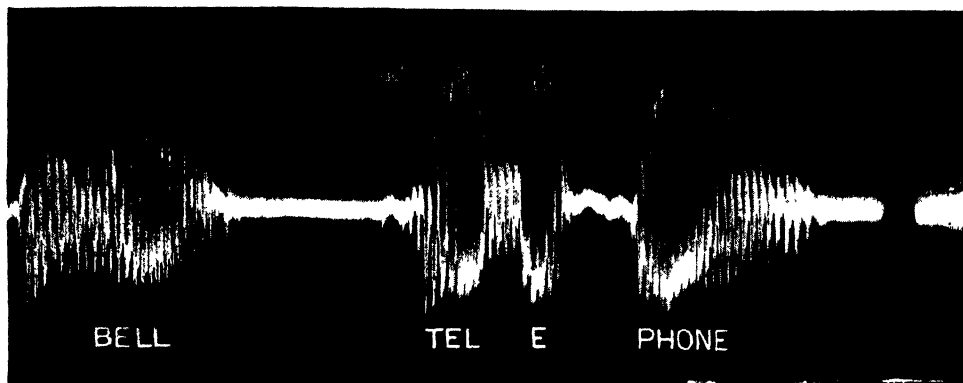


Photo: American Telephone and Telegraph Co.

A MAGNIFIED PHOTOGRAPH OF THE UNDULATING ELECTRIC CURRENT

It is the electrical counterpart of the sound waves entering the transmitter and coming out of the receiver.

vibration of the receiver diaphragm. The receiver diaphragm sets the air vibrating, and produces sound waves of the same kind as those that are acting upon the transmitter diaphragm.

The Microphone. A simple instrument which illustrates the working of the telephone transmitter can be made of three electric-light carbons. Two of the carbons are laid on a board a few inches apart, and the third carbon is laid across the first two. The first two carbons are then connected to a battery and telephone receiver. If a watch is laid on the board, the ticking of the watch can be heard in the receiver. The ticking jars the board, and each jar moves the upper carbon just a little and loosens the contact between the carbons. Between the ticks of the watch, the upper carbon drops down and presses more firmly on the lower carbons. When the contact is loosened, the battery current is made weaker, while a firmer contact makes the battery current stronger; thus, as the watch ticks, the battery current becomes alternately stronger and weaker. Each time the current becomes stronger, the electromagnet in the receiver jerks the metal disc, and then the magnet lets the disc spring back as the current becomes weaker. Thus the disc is jerked back and forth as the

watch ticks, and this motion of the disc produces sound in the air, the same kind of sound as the ticking of the watch.

The Transmitter. The telephone transmitter is a specially designed microphone. Two polished plates of carbon form the front and back of a circular box which is filled with carbon granules. The sides of the box are of insulating material, such as hard rubber. The carbon plate which forms the front of the box is attached firmly to the center of a metal diaphragm, which is just back of the mouthpiece (see illustration of transmitter). When one speaks near the mouthpiece, the sound waves in the air set the disc in vibration; the carbon plate attached to the disc moves in and out a little, as the disc vibrates. As the carbon plate moves in and out, it repeatedly changes the pressure on the carbon granules, crowding them more tightly together, and releasing them many times a second. The carbon granules form a microphone, like the carbon rods, but with many contact points instead of two. A battery current flows through the carbon granules and, as the pressure on them changes, the strength of the battery current changes; for, when the granules are more tightly crowded together, more current can flow, and when the granules are loosened, less current can flow.



Thus, when the diaphragm vibrates, the battery current continually varies in strength; that is, fluctuates or undulates.

It is this fluctuating current which flows along the line wire to the receiver at the other end of the line. This current varies as the sound of the voice varies, more rapidly for sounds of higher pitch than for sounds of lower pitch, changing in strength as the sound changes in intensity, so that the pitch, the intensity, and the quality of the sound produce corresponding frequency, intensity, and form of electrical vibration. This in turn reproduces sound of the same quality and pitch as the original sound, but of less intensity, because of loss of power in the line.

The Switchboard.

The switchboard in a telephone exchange is for the purpose of making electrical connection between instruments of persons desiring to talk with each other. There are two types

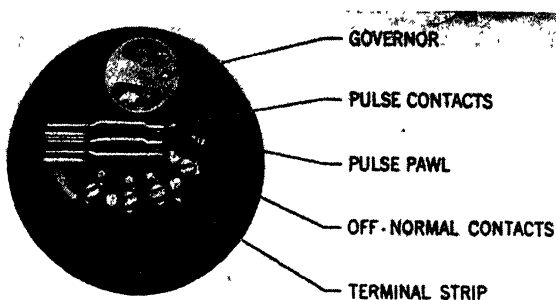


Photos: Bell Co.; Keystone

TO-DAY AND YESTERDAY

Below is shown a switchboard which when installed in Richmond, Va., in 1882, served the needs of the twenty-five telephones that the city contained. It had capacity for expansion to serve about two hundred subscribers. Above, a modern switchboard, with its scores of operators and supervisors.

of switchboards: the manual, which requires the human operator to complete the call, and the automatic, which is operated electromechanically (see subhead *Automatic Telephone*). When the manual switchboard is in use, the one who makes the call removes his receiver from the hook and a "drop" at the switchboard is released, thus indicating the telephone of the person making the call. In the modern offices of larger cities, the "drop," that is, an electromagnetic shutter, is replaced by a small electric bulb which calls the attention of the operator to the call. The operator then inserts an "answering plug," which is the end of a connecting circuit. After ascertaining the number wanted, the operator inserts the "calling plug" in that number, and presses a key which closes the ringing circuit of the party called. A "plug" consists of the ring-shaped ends of the wires in the connecting cord.



REAR VIEW OF 2-A TYPE OF DIAL
USED ON DESK STANDS, WALL SETS AND
PAY STATIONS

Photos American Telephone and Telegraph Co.

AUTOMATIC TELEPHONE TRANSMITTING DEVICE

Beginning to dial the number 8. The same motions are made in dialing the first three letters of the station to be called. At right, rear view of the dialing apparatus.

The multiple switchboard used in large exchanges is so arranged that each operator can call from her own section of the switchboard any subscriber whose line is connected with that exchange, but she can be called by only a limited number. The advantages are that the calls are divided among a number of operators, and each operator can complete any call from her own section of the switchboard.

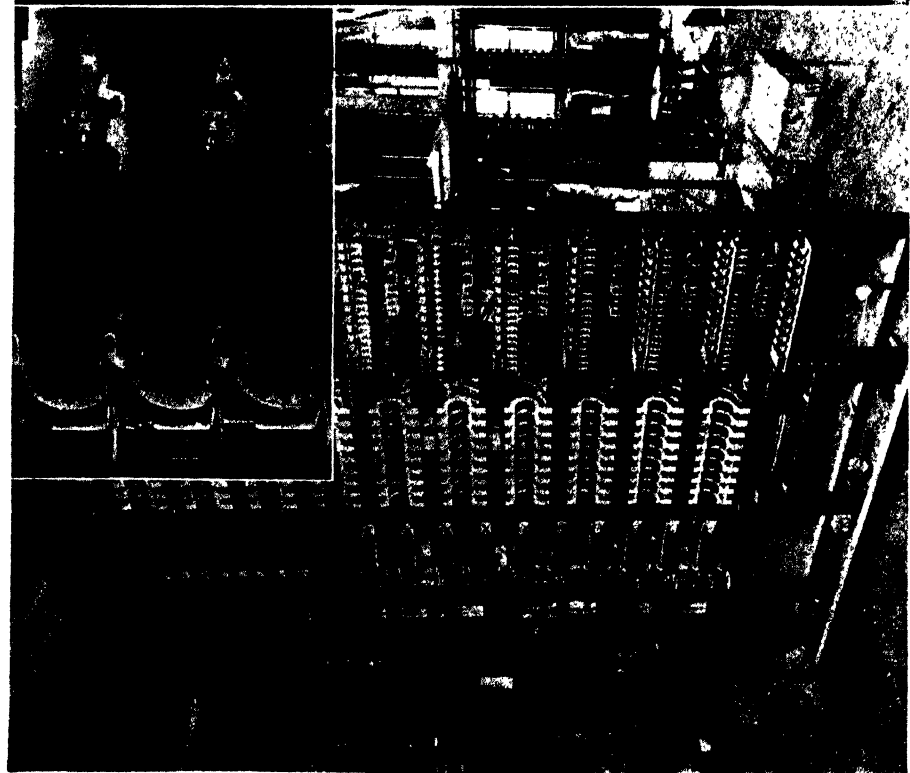
Power Required for a Telephone. The power embodied in the fluctuating electric current which carries the voice is very small. The telephone receiver is more sensitive to an electric current—that is, it responds to a weaker current—than any other instrument in common use. The power required to ring an electric doorbell would keep millions of telephone receivers buzzing for an equal length of time. Many times as much power is required for the ringing of the telephone bell as for operating the talking circuit.

Automatic Telephone. There are several systems of machine switching which require no operator at the switchboard. A system of electromagnets at the central station makes the connections. The devices for making connections, called *selectors* and *connectors*, not only select the number called for, but make a busy test, ring the signal at the called station, and complete the circuit of a talking current. The talking and ringing circuits are essentially the same as in the switchboard telephone.

The number is called by means of a dial. The caller's finger is inserted in the hole over the first figure, and the dial is rotated until the finger comes to the finger stop. Then the dial is released and springs back. Then the

second figure is taken in the same way, and so on until all the figures of the required number are taken. The dial is connected to a wheel with ten teeth, to correspond to the ten figures on the dial. When the dial is turned to the tenth figure, which, in fact, is 0, rather than 10, the wheel, by means of its teeth, makes and breaks the circuit ten times. In one system, two electromagnets in the selector, both operated by the turning of the dial, make the connections. There are in the selector one hundred contacts, ten rows of ten contacts each, arranged in a semicircular bank. Each contact consists of a free tongue or strip projecting inward toward the center of the curve. A vertical rod at the center carries two springs which can sweep over and under the contact strips, the two springs clasp a strip and making a firm contact. These two springs are called a "wiper." By raising the rod and turning it, the wiper can be made to connect with any one of the 100 contact strips. The use of the electromagnets is to raise and turn the rod to the position required to connect with the number desired. On the rod is a row of ratchet teeth, and the armature of the electromagnet operates a pawl which turns the ratchet wheel. Each time the circuit is closed, the electromagnet pulls up its armature and lifts the rod one notch. When the circuit is broken, the armature drops, and the pawl catches the next notch, the rod being prevented from slipping back by a "dog."

The first figure of the number called determines the number of notches the rod is raised. For example, if 5 is the first figure, the dial is first turned from 5 to the finger stop. This



Photos: Bell Telephone Co.

Details of the Machinery of an Automatic Switchboard. In left picture, corner, sequence switches mounted, showing constantly revolving drive shaft and magnetic clutches for revolving the switches. Below, sending equipment, showing placing of sequence switches. At right, selector frame, showing constantly revolving friction roller clutches, and racks by means of which selecting mechanisms are moved up and down.

gives five impulses to the electromagnet armature, raising the rod five notches, and raising the wiper to the fifth row of contacts. Another electromagnet, acting horizontally, turns the rod on its axis by means of a pawl and a set of teeth arranged in a circle around the rod. For example, if 6 is the second figure, six impulses are given to the horizontal magnet, turning the rod six notches and connecting the wiper with the sixth contact. Connection is then made with the number 56. For an exchange of not more than a hundred subscribers, one selector for each subscriber makes all the connections. If there are more than 100, and not more than 10,000, subscribers, additional sets of selectors must be used. The first selector acts as a connector, and connects the subscriber to a certain selector in another group of 100 selectors. This selector then completes the connection as desired. In this case, there are four figures in the number called.

The automatic system is practicable in both rural and urban communities, and has been successfully adopted in the Chicago area. Operators are still needed, of course, for special calls.

Some Special Applications of the Telephone. The electrophone is a telephone specially arranged to enable subscribers to listen to performances in theaters, concert halls, etc. A number of subscribers may be connected to the same transmitter.

The telephone fire alarm has the advantage over other fire-alarm systems, in that it not

In war, the telephone is used to keep the commander in chief in touch with every portion of the army. The line wires are usually of thin, bare copper wire wound on a reel, one

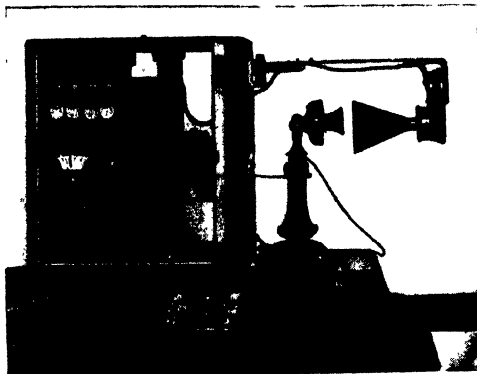


Photo Keystone

MEASURING THE LENGTH OF A CONVERSATION

When you talk to a friend for six minutes and are charged for that length of time, you protest that the conversation ended promptly at the end of the permitted period of three minutes—but your protest is unavailing; the telephone company timed you. There is now a device consisting of a glass sand timer, set for three minutes, which can be attached to any telephone, as shown above. It is an English invention.

man letting out the wire as he rides along, another following, and by means of hooked rods lifting the wire to branches of trees for insulation. The earth is used for the return circuit. A metal rod at each end of the line is driven into the damp ground or into living trees, where the sap makes the connection. A buzzer is used for signaling, and the Morse code is commonly used, as such signals are transmitted more accurately than the sounds of the voice. The complete set is made very light and compact. On a war vessel, the commander is in telephonic communication with every part of the ship. The instruments are made very substantial, to withstand the shocks to which they are subjected, some being bullet-proof. (For use of radio telephony in war, see RADIO COMMUNICATION.)



THIS TELEPHONE ANSWERS AUTOMATICALLY

The apparatus at the Dalecarlia Reservoir, New York, which automatically announces the height of water in the reservoir. A regular telephone number, known only to the engineers in charge of the plant, is called from any point in the district; the incoming call causes the hook holding the receiver to raise automatically and set in motion a device which announces by means of buzzing signals the number of feet of water shown by the gauge on the reservoir.

only rings in an alarm signal, but enables the person sending in the alarm to give particulars to the officials.



Photo: American Telephone and Telegraph Co.

RECEIVING APPARATUS OF TELEPHOTOGRAPHY

Engineers and operator are examining a newly developed negative of a picture transmitted by telephone from Chicago to New York City.

The helmets of divers are fitted with transmitters, so that the diver is in communication with the boat above.

For railway service, a telegraph line may be made to serve as a telephone line. The telephone is extensively used in train-dispatching, its advantage over the telegraph being greater speed and the fact that it does not require a trained telegraph operator to serve as train dispatcher. Telephone sets are installed at sidings, crossings, water tanks, and other similar places, so that a train crew may, in case of emergency, communicate quickly with the train dispatcher. Many railroads, in addition to the dispatching circuit, install also a message circuit, and frequently a block line for communication with the operators of interlocking switches and block signals.

Another important branch of the telephone industry is the private exchange, in reality a telephone system under private control. Some private exchanges possess more telephones on their lines than are required to care for the business of cities of considerable size. Every large business house has its own private exchange, for communication between the various departments of the house.

Sending Pictures by Wire. In 1924 announcement was made of a perfected device by which photographs can be transmitted by telephone. The first commercial picture-transmission service was established in April, 1925, between New York, Chicago, and San Francisco. A photograph may be transmitted to a station hundreds of miles distant, and received in the form of a negative film, in from five to seven minutes.

The method now used for the successful transmission of pictures over telephone wires is simplicity itself. The apparatus is designed to transmit a picture five inches by seven inches. The film upon which a picture has been transferred is placed in the transmitting apparatus, simply by rolling it up in a cylindrical form. During operation, a very small and intense beam of light shines through the film and strikes the photo-electric cell within.

The film is rotated at a uniform speed and, by means of a screw mechanism, advances parallel to the axis of the cylinder. The motion of the cylinder relative to the beam of light is, therefore, the same as that of the cylindrical record relative to a phonograph needle. In this way, the picture is scanned, as it were,



Photo: U & U

MOVING PICTURES SENT BY WIRE

Moving pictures were first sent from Chicago to New York in 1928. The film was ten feet long, and showed in close-up the face of a screen favorite, smiling and talking, with clearly marked lip movements. In less than five hours after the Chicago telephotograph machine began sending the film, an accurate duplicate was available for showing to a New York audience. In the illustration at left is seen the receiving set; at right, the film (in three parts).

and the intensity of the light reaching the photo-electric cell is affected by each minute portion of the picture. This variation in the amount of light striking the sensitive surface of the cell gives rise to an electric current which, through the agency of a vacuum-tube amplifier, controls the current flowing over the telephone line.

At the receiving end, an unexposed photographic film is rotated under a beam of light in a manner similar to that at the sending end. The two films are caused to rotate at exactly the same speed, through the agency of an auxiliary connection, and the impulses starting from the photo-electric cell at the sending end control, by means of the light valve, the amount of light reaching the film at the receiving end.

This light valve is very important in the successful reception of pictures transmitted over telephone wires, since it takes the fluctuating currents off the line and transforms them into corresponding variations of light. The amount of light that passes the revolving film at the sending end is, of course, constantly increasing or lessening, according to the black and white that make up the picture. Where the film is dark, the light is reduced and so, also, is the current; but where the film is transparent, the light passes through with little loss and causes a correspondingly strong current from the photo-electric cell. The fluctuating currents, when introduced into the receiving apparatus, register themselves finally in the varying shades on the photograph re-

produced. With great fidelity, the delicate values of the photograph are reproduced, the details being brought out clearly. From the positive film received, negatives may be made and used directly

for making zinc or copper etchings, without the use of a halftone screen, thus eliminating the necessity of the engraving process. While telephone transmission of pictures is of great importance in newspaper work, it may prove to be of equal importance in other fields; as, for example, in identifying criminals by transmitting finger prints, and in transmitting signatures for banks.

A later variation of telephony is the invention of a system by which a picture of the person or persons present before the device may be transmitted. Thus, a person conversing by telephone with another may be dis-

IDENTIFI
WANTED

13 10 20
20 I



N.Y. POLICE DEPT.

Photo: American Telephone and Telegraph Co.

FINGER-PRINT RECORD

Everything which appears in the illustration was telephoned from New York to Chicago.



Photos: American Telephone and Telegraph Co.

TELEPHONING ACROSS THE OCEAN

Above, the transatlantic receiving antenna at Houlton, Maine, of the "wave" antenna type. Below, the 200-horse power amplifier at Rocky Point, Long Island, which projects the voice across the North Atlantic Ocean.

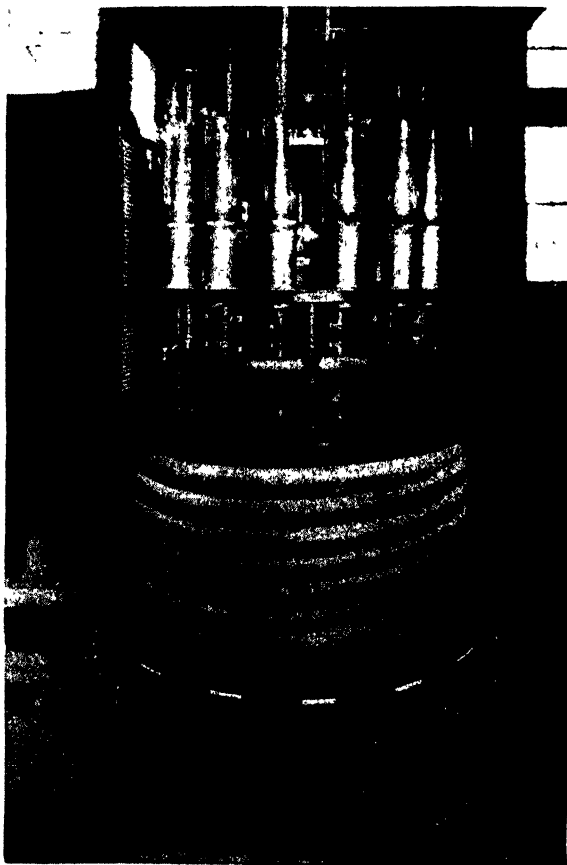
tinctly seen, although many miles distant. The development of this device for practical application, however, is yet to come (see TELEVISION).

From facts and principles acquired in the progress of the telephone art, telephone engineers have made contributions to the improvement of the phonograph, both in the recording and the reproduction; in the interconnection of radio-broadcasting stations by telephone circuits; in diagnosis and apparatus for the deaf; and in talking moving pictures.

Other Developments. In October, 1929, it was announced that experiments in a London suburb had resulted in the development of a new sound-reproducing system with novel features. For instance, one feature was said to be a device, to be attached to a telephone, which takes the message when there is no subscriber to answer, and repeats it to him on his return by the mere lifting of the receiver. By the same invention, it was said, telephone conversations may be permanently recorded and filed. But the most important of the new devices

was a high-speed telephone which, the inventor claimed, would cut the cost of trans-Atlantic telephoning four-fifths. Other developments promised through this new system included reduction of the cost of talking pictures and other sound reproduction, improvement of the phonograph, and the production of talking books for the blind and invalids, with other possibilities claimed.

Dr. Kurt Stille, a German scientist, and Louis Blattner, an English inventor, were said to be associated in the development of the new system, which is supposed to be based on a discovery made by Poulsen, a Danish scientist, of a method of fixing electrical waves on a steel wire by a process of magnetization. Introduction of the new devices in the United States was promised. Telephoning to ships at sea was accomplished in 1920.



Trans-Atlantic Telephony. There are now three complete channels for trans-Atlantic radio telephony (see RADIO COMMUNICATION). Experimental work has proved the practicality of a telephone cable between America and England, and the line, now under construction, will be completed within two or three years.

How to Make a Simple Telephone. Two boys can easily make and set up between their homes a good, working telephone line. It will be necessary to have two telephone receivers, which will serve also as transmitters. The receivers may be purchased in an electrical shop, or they may be made as follows: Cut off a piece of curtain pole about one and one-eighth inches in diameter and three and one-half inches long; or, if a wood-turning lathe is at hand, turn out such a piece. Bore a hole three-eighths of an inch in diameter, lengthwise through the center. Bore two holes one-sixteenth inch in diameter, lengthwise through the rod by the side of the first hole. The last two holes are for the wires to pass through.

A round wooden box about two and one-half inches in diameter is needed; a wooden pill box can be used, or one can be turned on the lathe. If a pill box is used, two wooden lugs must be glued to the bottom of the box, to hold the screws by which the cap is fastened. If the box is lathe-turned, the sides can be made thick enough for the screws. The cap is made of thin wood, hard rubber, or hard fiber, cut to fit the box, and having a hole about half an inch in diameter in the center. It must have a thin rim or collar, to separate it from the disc. The disc is made of thin, soft iron, such as photographers use for tintypes, and this must be of the thinnest variety. The magnet is made of a piece of steel rod three-eighths of an inch in diameter, and four and one-quarter inches long. If soft steel is used,

it can be hardened by heating it red hot and then plunging it into cold water. The steel rod can be magnetized at the nearest electric-light plant, where the dynamo-tender will, no doubt, be willing to hold it for a few minutes against the field magnet of one of the large dynamos. The parts described, when put together, appear as in the illustration appearing on an earlier page in this article, which represents the receiver as if it were sawed through lengthwise from end to end. In addition to the two receivers, two electric bells, two switches, two push buttons, and four dry cells are needed. These are connected as in the illustration. Care must be taken to connect the dry cells in series; otherwise, one battery will neutralize the effect of the other. The push buttons are for the purpose of ringing the bells, and the switches for making the

proper connections for ringing and talking. It will be well to set up both sets in one room and to experiment with the switches and push buttons, to learn how to make the proper

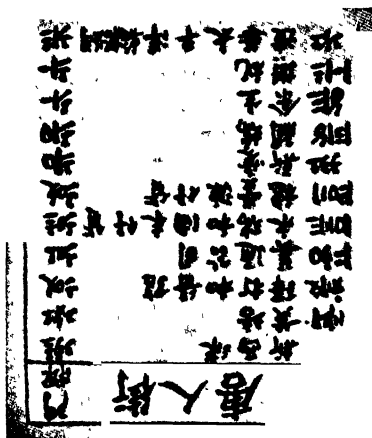
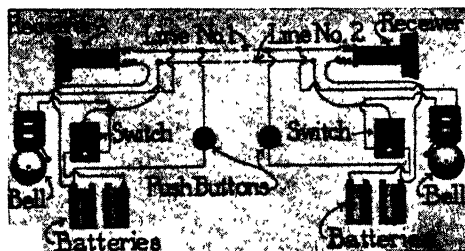


Photo: American Telephone and Telegraph Co.

CHINESE TELEPHONE DIRECTORY

A page of a directory issued for Chinatown in San Francisco.



ARRANGEMENT OF TELEPHONE LINES

Two boys can construct a simple line with two telephones, making connections as shown above.

connections, before setting up the line between two houses, as corrections are then more easily made.

Brief History of the Telephone

Soon after the invention of the Morse telegraph, the idea of "talking by telegraph" began to grow in the minds of inventors. The outgrowth of this idea was the modern telephone. The telephone that was first patented and first exhibited to the public was that of Alexander Graham Bell. His patent, dated March 7, 1876, was for "certain new and useful im-

provements in telegraphy." One of these "improvements" was "the method of transmitting vocal and other sounds by telegraphy." In the Bell telephone, the transmitter and the receiver were constructed on the same principle as the receiver of the modern telephone. Each receiver had a piece of parchment tightly stretched over a circular frame, and a piece of

soft iron fastened to the center of the parchment. An electromagnet within the frame was placed with one end near, but not touching, the parchment.

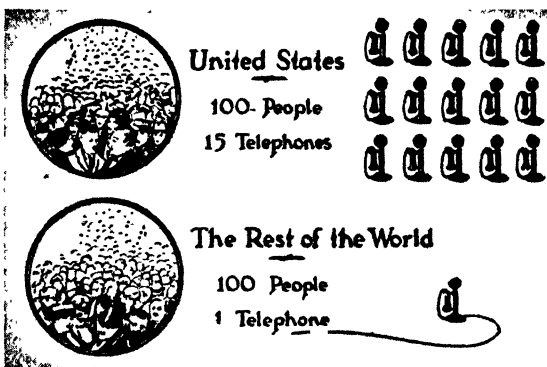
The Bell telephone was first exhibited to the public at the Centennial Exposition in Philadelphia, in 1876, and the new invention was received with incredulity and ridicule. Bell was called "a crank who says he can talk through a wire." He had to prove the worth of his invention. To do this, he borrowed a telegraph line in Boston, having a length of two miles, and with a friend held a conversation over the wire, the first sustained conversation by telephone; the report of this conversation was published in a Boston newspaper. Soon after this, Bell lectured in Salem, and a report of the lecture was sent by telephone to the Boston *Globe*, the first news transmitted by telephone. This aroused public interest, and in the following year (1877), the telephone business made a beginning.

In May, 1877, a young man named Holmes, who installed burglar alarms in business houses in Boston, borrowed five telephones and set



A STRIKING COMPARISON

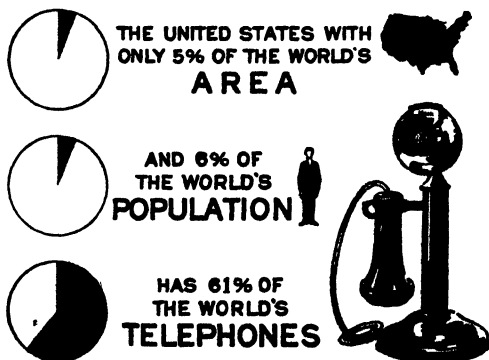
There are more telephones in the largest city of the United States than in the three southernmost continents of the world. This condition may not change in a century.



THE WORLD'S TELEPHONES

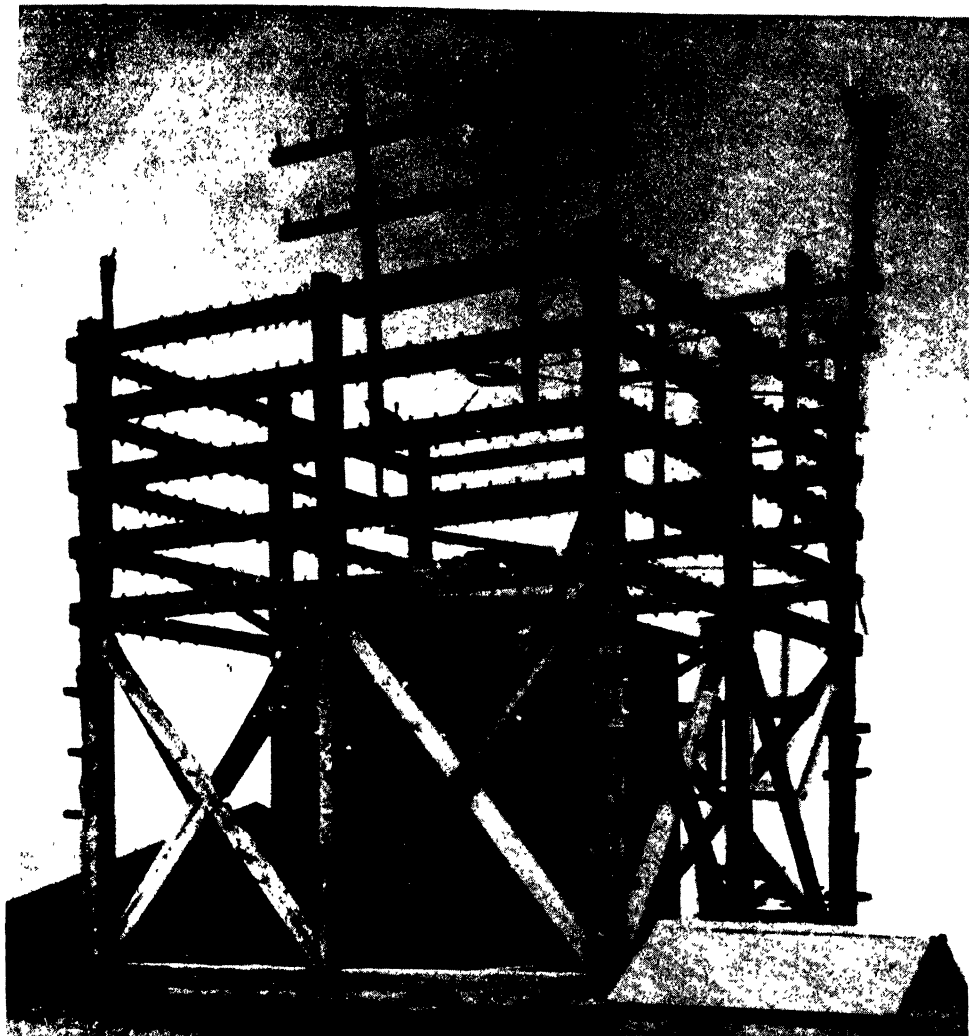
The proportion is constantly increasing.

THE U.S. HAS 10 TIMES ITS SHARE OF THE WORLD'S TELEPHONES



THE GROWTH OF THE INDUSTRY IN THE UNITED STATES

them up in five banks, connecting them to the wires of the burglar alarm. The five telephones could be connected by a switch in Holmes' office. This was the first telephone exchange; it was a crude affair compared with a modern exchange. In the same month, a man named Emery leased two telephones, paying twenty dollars, the first money transaction in the telephone business. From this small beginning, the business grew until, in August, 1877, there were 778 telephones in use. But this was insignificant for such an important invention as the telephone. Capital could not be secured to develop the business. Bell had associated with him three men, Hubbard, Saunders, and Watson. In the midst of their discouragement, the Western Union Telegraph Company came out in opposition to Bell, claiming that he was not the original inventor of the telephone, but that its company, under the name of the American Speaking-Telephone Company, was prepared to supply "superior telephones with all the latest improvements." This looked like defeat for Bell,



Photos: Bell Telephone Co.

An Improvement in Development of Terminals. Above, old-time wiring on a roof terminal, when all wires were strung in the air. Below, underground cables of the present day, strung in tubes, entering the central telephone exchange.

but, instead, it stimulated interest in the telephone to such an extent that capital began to come in to Bell and his associates, and in two months they had fifty thousand dollars and were leasing telephones at the rate of a thousand a month.

In 1878 the Bell Telephone Company was organized under the management of Theodore N. Vail, with a capital of \$450,000. But the battle was not over. The Western Union Telegraph Company owned the Edison transmitter, while the Bell Company had only the Bell receiver, which served as both receiver and transmitter. At this juncture, Francis Blake came to the Bell Company with a transmitter of his own invention, which he offered to sell for stock. His offer was accepted, and the Blake transmitter, proving superior to the Edison device, gave the Bell Company the advantage it needed. The Western Union next attacked the legality of the Bell patents. The fight, which continued for eleven years and comprised six hundred lawsuits, was decided in Bell's favor. This was the end of the difficulties. Bell stock jumped to fabulous prices. By 1898, the company had installed its first million telephones. So large has the telephone business become that the Bell patent is recognized as the most valuable patent ever issued in any country.

Present Extent of Telephone Service. Nowhere else in the world has the telephone industry grown as rapidly as in the United States. During 1926, each man, woman, and child in the United States used the telephone 205 times, on the average. Canada came next, with 196 calls per capita. Germany, which ranked sec-

ond to the United States in total number of telephones, reported only 32 calls per capita. In Great Britain there were 27, and in France 17. While on January 1, 1929, there was one telephone in England for every twenty-nine

people, there was one telephone for every seven people in the United States. While farms in England are practically without telephone connections, in the United States there is a rural telephone for about every two farms. The world's total mileage of telephone wire exceeds 95,941,000; of this total, the United States has 57,960,000. There are more than 17,000 telephones in

the United States. Europe has about 8,000,000, while the remaining 3,551,000 are distributed between Asia, Africa, Oceania, South America, and all of that part of North America outside of the United States.

In the Canadian provinces of Alberta, Manitoba, and Saskatchewan, there are telephone systems owned by the provincial governments. In the entire Dominion, there are about 200 municipal exchanges, 400 stock companies, 140 coöperative companies, 31 owned in partnership, and 113 in the hands of private individuals. There are, in all the provinces, about 1,009,200 telephones, the maintenance of which requires about 2,574,000 miles of wire. A.T.&T.CO.



Photo: U & W

EARLIEST RECEIVER AND TRANSMITTER

Inventive genius has brought to perfection the crude instruments of the period of development.

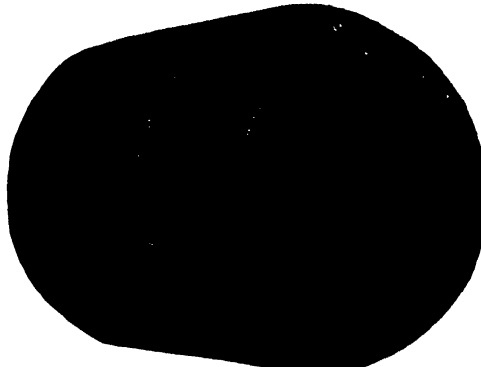


Photo: American Telephone and Telegraph Co.

A NEWLY DEVELOPED TELEPHONE CABLE

It contains eighteen hundred pairs of wires. Each wire is insulated by a thin strip of paper, and each pair of wires connects a subscriber with the telephone exchange.

Related Subjects. The reader is referred in these volumes to the following articles:

Bell, Alexander Graham
Radio Communication
Telegraph

Teletype
Television

TELEPHONE, WIRELESS. See RADIO COMMUNICATION.

TELEPHOTO, *tel' e fo toh*. See PHOTOGRAPHY (By Telephone and Radio).

TELESCOPE, a magnifying device used for viewing distant objects. It was the telescope that gave to man an idea of the vastness of the universe and of the smallness of his own world, floating like a grain of sand in the immensity of space. It overthrew existing notions of man's destiny and importance in the scheme of things, and forced him to shape a new philosophy. In fact, the revolution wrought by the telescope was so great that it can hardly be exaggerated.

The transforming power of the telescope on man's thinking was shown from the very invention of the instrument, in 1608. Roger Bacon may have had a telescope several centuries before, but the credit of invention has been assigned to various persons, and Hans, or Johann, Lipperhey, a Dutch optician, is most commonly accorded the honor. It is said that he conceived the idea accidentally, while looking through some old spectacle lenses. When two lenses were held in a certain position, the weathercock on a distant steeple appeared near to the eye looking through them. Galileo, the Italian astronomer, was the first to bring out a practical instrument. He heard of Lippershey's invention, and made one of his own the next year. Galileo's first telescope was a crude affair, and the best one he was

swarm with countless glittering points of light. The naked eye can see between 2,000 and 3,000 of these stars or suns; the telescope reveals millions of them. Stars that seem single to the unaided vision are split up by the telescope into two or three stars, turning about one another in space. The Milky Way, which makes but a luminous patch across the sky, is dissolved into countless multitudes of distinct stars. Among the seven chief stars of the Pleiades, the telescope shows a star cluster in which 2,326 stars have been counted.



Photo: Keystone

FLAWLESS SEVENTY-INCH GLASS

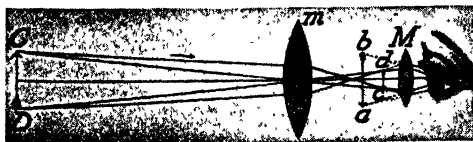
The largest piece of optical glass ever cast successfully in the United States was produced by the Bureau of Standards. It is eleven inches thick, weighs 3,500 pounds, and was cooling for nine months. It was made in 1927 for Ohio Wesleyan University, Delaware, Ohio.

Structure. The essential parts of a telescope are an *objective* (also called *object glass* and *object lens*) for the formation of an image of the object under observation, and an *eyepiece* for magnifying the image. These parts are set in a tube, so constructed that the observer can lengthen or shorten the distance between them. Astronomical telescopes are of two types, refracting and reflecting. In refractors the objective is a large convex lens of long focus, and the eyepiece a convex lens

of short focus. In reflectors the object glass is a concave mirror which reflects the rays of light to a focus.

The accompanying diagram shows the principle of the astronomical refractor. The object viewed is marked *CD*; *m* is the objective, and it forms an inverted image *cd*. This is viewed through the eyepiece *M*, which produces a magnified image, *ab*, of the first image. The first image, *cd*, is as much smaller than the magnified image, *ab*, as the focal distance of the eyepiece is smaller than that of the objective. The objective has to be made large, in order to collect enough light to permit magnifying of the image without too much loss of distinctness.

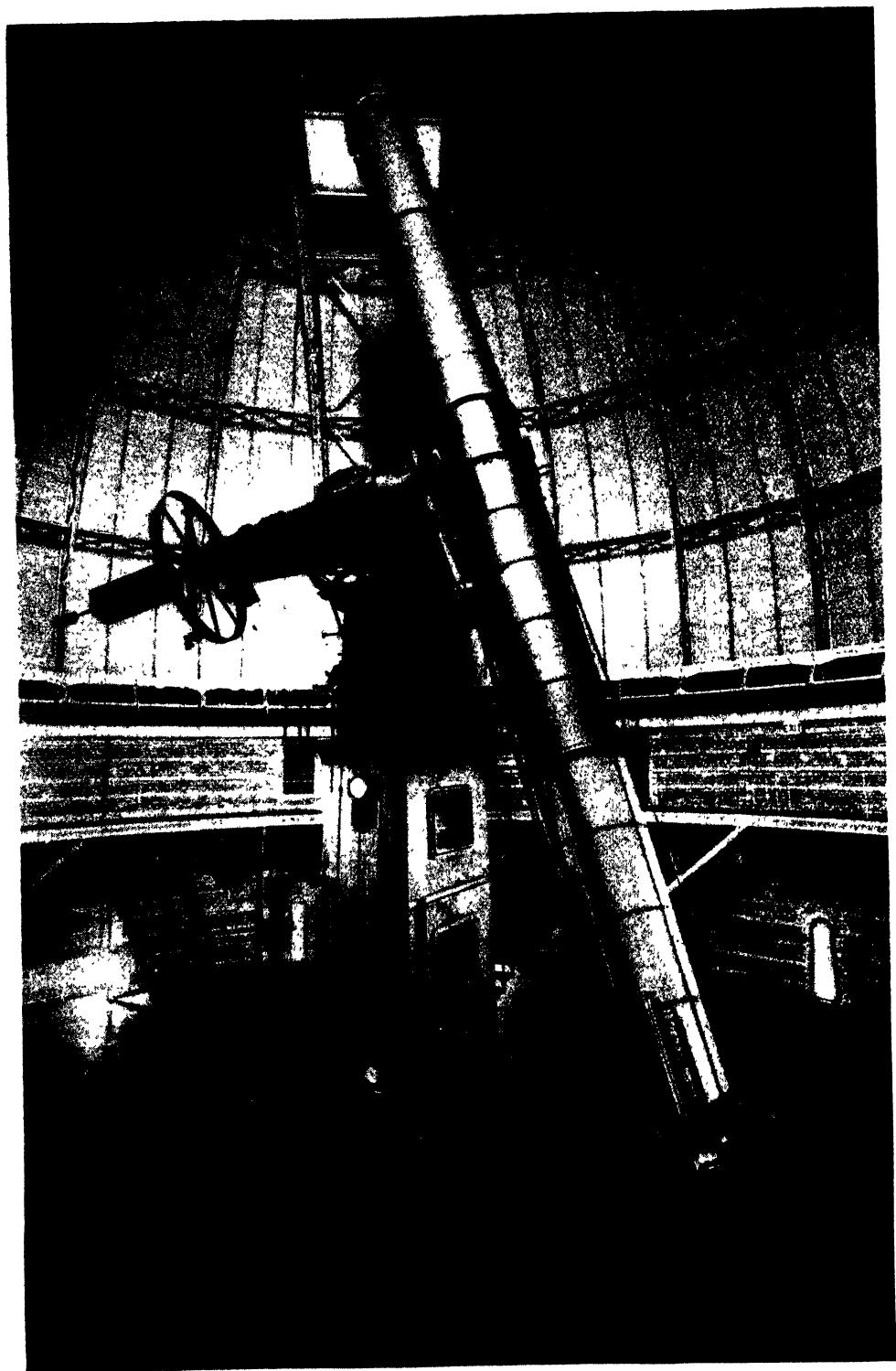
Terrestrial telescopes, which are constructed for viewing objects on the earth, have two double-convex lenses between the eyepiece and the objective, and, as the rays diverge from the inverted image, they cross and form an erect, magnified image. The inversion of the image in astronomical instruments does not interfere with the accuracy of observations.

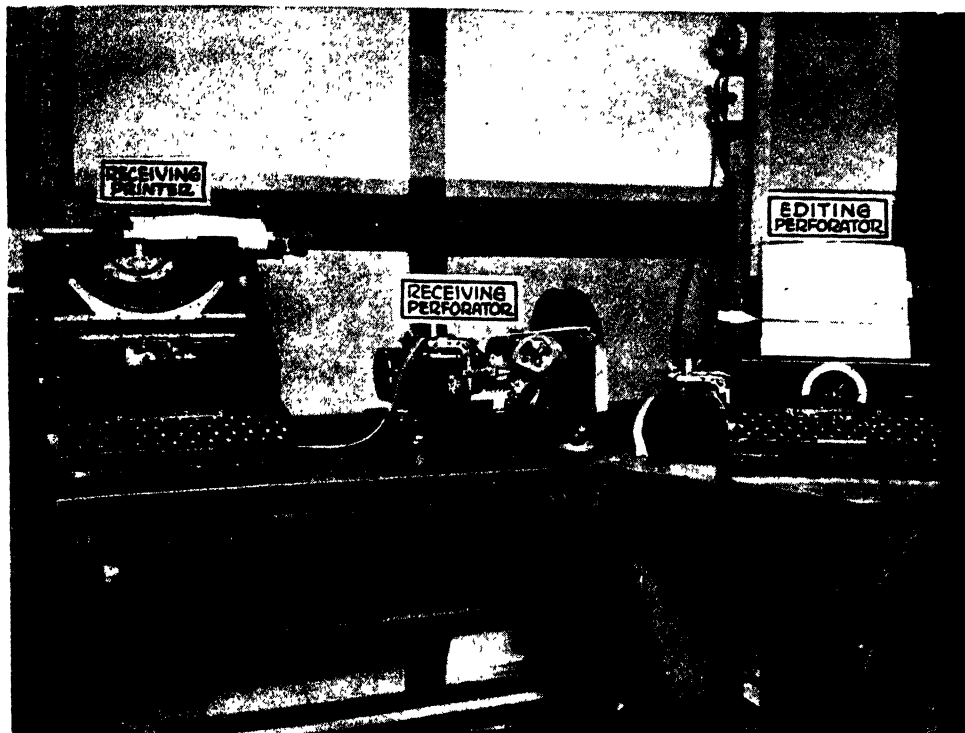


PRINCIPLE OF THE REFRACTING TELESCOPE
Explanation appears in text.

able to devise before his death magnified but thirty-three times. Nevertheless, he was able to discern four of the satellites of Jupiter, and to discover unknown characteristics of the sun, the moon, and other heavenly bodies.

Under the action of a powerful lens, the summer heavens are transformed, and they





RECEIVING PERFORATIONS TYPED MANY MILES DISTANT

The illustrations show the machines in the editorial offices of the newspaper receiving material typed at a distance on a machine that is much like the ordinary typewriter in general appearance.

Great Modern Telescopes. The largest refracting telescope in the world is that in the Yerkes Observatory, on the north shore of Lake Geneva, Wisconsin. It is the property of the University of Chicago. The object lens has an aperture of forty inches and weighs about 760 pounds. The tube is sixty-two feet in length, has a weight of six tons, and is mounted upon a massive cast-iron column, which rests upon a solid concrete foundation. Clockwork located in an upper section of the column drives the mechanism. The apparatus occupies a dome ninety feet in diameter, which has a rising floor seventy-five feet across. This floor moves through a range of twenty-three feet between two balconies, and is close to the lowest point when the observer is viewing a star near the zenith. Second only to the Yerkes refractor is the thirty-six-inch telescope of the Lick Observatory at Mount Hamilton, Calif.

The great reflecting telescope of Lord Rosse, at Birr Castle, in Ireland, was for a long time the largest of its kind in the world. Since 1914 it has been a possession of the South Kensington Museum of Science. The reflecting mirror of this instrument is six feet across, but the telescope is surpassed in size by those of Mount Wilson Solar Observatory (8 feet 4 inches) and

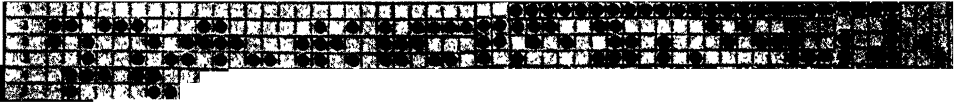
the Dominion Observatory, near Victoria, B. C. (6 feet 1 inch). Other notable reflectors are those at Harvard University, Melbourne, and Paris. The telescope at Harvard, which has a mirror five feet across, has been used with remarkable success in photographing the stars.

Plans have been made for the building of a new telescope with a 200-inch reflecting mirror, which will bring into view millions of stars now uncharted, and have more than four times the power of the Mount Wilson instrument. The mirror is to be made of fused quartz, and years will be required to grind it. The California Institute of Technology at Pasadena will have control of this powerful telescope, and the funds are to be provided by the International Education Board of New York City, affiliated with the Rockefeller benefactions.

Related Subjects. The reader is referred in these volumes to the following articles:

Astronomy	Light	Observatory
Lens	Milky Way	Star

TELETYPE, OR TELETYPESETTER, a machine for setting type by telegraph. It does not itself set the type, but operates a linotype or intertype machine automatically. At the sending end, there is a machine similar to a typewriter, which perforates a paper tape with



PERFORATED TAPE OF THE TELETYPE

letters in code, as shown in the illustration. This tape is passed through a transmitter which changes the characters into electric impulses, for transmission by wire. At the receiving end, which may be many miles distant, the electric impulses operate a machine which perforates a tape like the original. This tape is fed into a machine which operates the typesetting machine.

The teletype was conceived and begun by Frank E. Gannett of Rochester, N. Y. In



EQUIPPED WITH TELETYPE UNIT

A linotype in a metropolitan newspaper office with teletype attachment.

developing the invention, others were associated with him. Mr. Gannett is a newspaper publisher, and his purpose in inventing the teletype was to make possible rapid transmission of news over long distances. In addition to doing this, it will also be of value in book publishing; for the publisher may keep rolls of perforated tape on hand for printing new editions, instead of heavy and bulky metal plates, as at present.

TELEVISION, the reproduction of a distant scene or object, so that it becomes visible to the eye of the observer, is one of the most striking recent accomplishments of physics. The method employed may be described, very briefly, as follows: The surface of an object, like a human face, must be considered as broken up into a series of small unit areas. The differences of light and shade of these small areas must be translated into electric currents, each exactly proportional to the amount of light coming from the corresponding area. These currents must be transferred to the distant station, either by wire or by radio waves, and there the various currents must be transformed back into the varying degrees of light and shade, properly placed to produce an image of the original subject.

The subject who is to be "seen" is placed in front of a large disc, in which there are fifty holes, arranged spirally, at gradually increasing distances from the edge. A very brilliant arc light, properly focused by lenses, is placed behind the disc. A diaphragm, about fifty times as wide as the holes in the disc, is inserted between the disc and the subject, in such a way as to permit only light which passes through one hole at a time, to fall on the subject, illuminating about one twenty-five-hundredth of its surface. As the disc rotates, light passing through a hole traces a line across the subject, the next hole a parallel line, and so on, until for one revolution of the disc the light has covered the whole of the subject by a series of fifty parallel (and slightly overlapping) lines.

The disc is rotated about eighteen times per second, and on account of the persistence of vision, it appears to be steadily and uniformly illuminated. Actually, the light falls on only a single small area (about one twenty-five-hundredth of the whole), at any instant. Light is diffused from the different elements of the surface, and falls on large potassium-hydride photo-electric cells which emit electric currents that are exactly proportional to the intensity of the light at any instant. As the spot of light passes over the entire subject, the current from the photo-electric cells fluctuates in exact proportion to the brightness or darkness of the different parts of the subject.

These currents are amplified by radio vacuum tubes, and are transmitted, either by wire or by radio waves, to the receiving station. There they are again amplified by vacuum-tube



Photos: General Electric Co.

The Receiving Unit of Television. At the left, the rear view of a receiver. In the top compartment is the neon lamp; below, the scanning disc, driven by a small motor; next, the A and B batteries; and in the bottom compartment, the amplifier. At the right, a television cabinet in the home

systems, and the resulting currents are used to actuate a large neon lamp, similar to the neon tubes used in electric-light signs, except that the cathode is rectangular, being about two by two and one-half inches in size. This



cathode is viewed through a diaphragm and a rotating disc that is exactly similar to, and synchronized with, the rotating disc at the transmitting station. The different parts of the cathode of the neon lamp are seen to glow with a brightness proportional to the amount of light sent from the corresponding points of the subject, as these points are illuminated in succession, eighteen times per second. A picture of the subject at the transmitting end therefore appears on the glowing cathode at the receiving end.

This form of receiving screen is intended primarily for telephone conversations, and reproduces, at the receiving station, the face of the speaker at the transmitting station, as an image about two by two and one-half inches in size. If a larger scene is to be reproduced, a different receiving screen, about two by two and one-half feet in size, is used. This screen is large enough to be viewed by an audience of considerable size. It consists of a very long neon tube which has been bent into a grid of such form as to cover the entire screen in successive parallel lines. It is provided with 2,500 different external electrodes and one internal electrode. As the current is sent to each of these small external electrodes in turn, the grid glows at that point with a brightness proportional to the current passing at that time.

The photo-electric cells at the sending station insure that this brightness is proportional to the amount of light diffused from the corresponding point on the subject, at the instant of its illumination. The contacts with the different electrodes must be made in perfect synchronization with the rotating disc at the transmitting station.

It is now possible to install such television devices, so that two persons holding a telephone conversation may "see" each other as they converse. This was actually done in April, 1927, in a communication between New York and Washington.

Television in color has recently been made possible by the invention of a new type of photo-electric cell that is equally sensitive to all colors of the visible spectrum. Sodi-



Photos: General Electric Co.

THE TELEVISION TRANSMITTER

Above, a young woman before the transmitter. Below, a stage set for enacting a play to be reproduced by television.

um is used in place of potassium in the new cell, and three groups of photo-electric cells, covered with red, green, and blue color filters, respectively, are used. These sift out the colors that are to be stopped, and allow the passage of those that correspond to the color of the object. Three sets of signals are transmitted, one for each fundamental color, and three lamps receive the image. The lights from the three sources are combined at the receiving end, to present the picture in its true colors. An early demonstration of color television was made in 1929; the American flag, a varicolored ball, a bouquet of roses, a slice of water-

melon, etc., were reproduced in their natural colors.

Although various features of the television apparatus have been known for many years, it was not until after current-amplifying devices were developed that much progress was made. In 1925 C. Francis Jenkins, in America, and J. W. Baird, in England, almost simultaneously exhibited images transmitted by electric current. Dr. E. F. W. Alexander of the General Electric Company, and Dr. H. E. Ives of the Bell Laboratories, developed the same principles, and the first public demonstration was made by Dr. Ives in 1927. B.M.W.

TELEVOX. Down the ages, philosophers and poets have visioned a faithful, uncomplaining automatic man—a likeness of man himself, fashioned out of scraps of material wrenched from the grasp of Mother Earth—upon whom could be imposed the drudgery of the workaday world. In the year 1928, the mechanical man was developed to a high degree of efficiency and called *televox*. *Tele* comes from a Greek root meaning *far off*; *vox* is from the Latin word meaning *voice*. Therefore, the real meaning of *televox* is *voice from afar*. Its inventor is R. J. Wensley, an engineer of the Westinghouse Electric & Manufacturing Company.

Development of Televox. With the public telephone system brought to a high state of perfection and available almost everywhere, it seemed strange that it could not be used for the purpose of controlling small electrical stations. The use of these small distributing substations is becoming more and more the accepted method of supplying the electrical needs of large cities. If there were only a machine with sufficient intelligence to answer the telephone, carry out a few simple instructions, and give some replies, the problem would be solved.

In response to this need came the *televox*. It was developed to supplement, but not to supplant, supervisory control systems which have come into such general use in the past few years. Literally, it is a machine endowed with enough apparent intelligence to carry on a conversation over a standard telephone, through exchanges and their connection cables, in exactly the same manner as would a human operator. Obviously, it is not essential that the *televox* should have the outward form of a man. It could be housed, as well, in a box or cabinet. Automaton having human form are usually called *robots* (see subhead, below).

How It Functions. The standard telephone systems provide channels which will carry all frequencies between 300 and 2,800 cycles with a reasonably small attenuation. The operating tones or "voice" of the *televox* must stay within these limits. Frequencies varying from 400 to 800 cycles are being used, as the best transmission is obtained within these limits.

Three whistles provide the means of generating the sound at the dispatching end of the line. Small pitch pipes or tuning forks may be used, and, with such equipment, any telephone becomes a dispatching point.

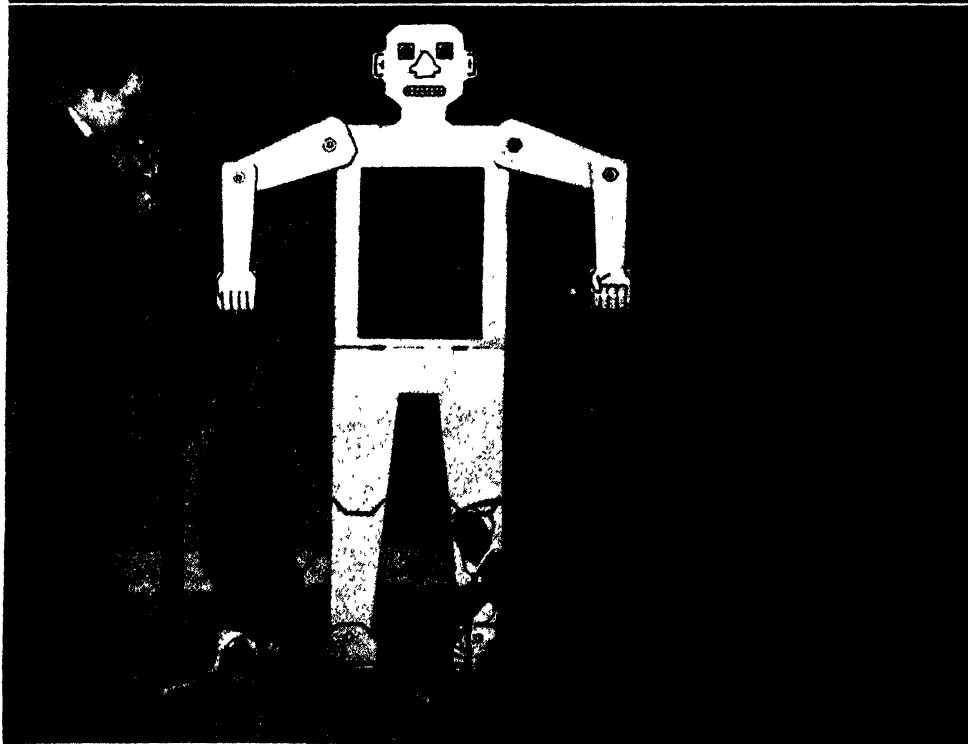
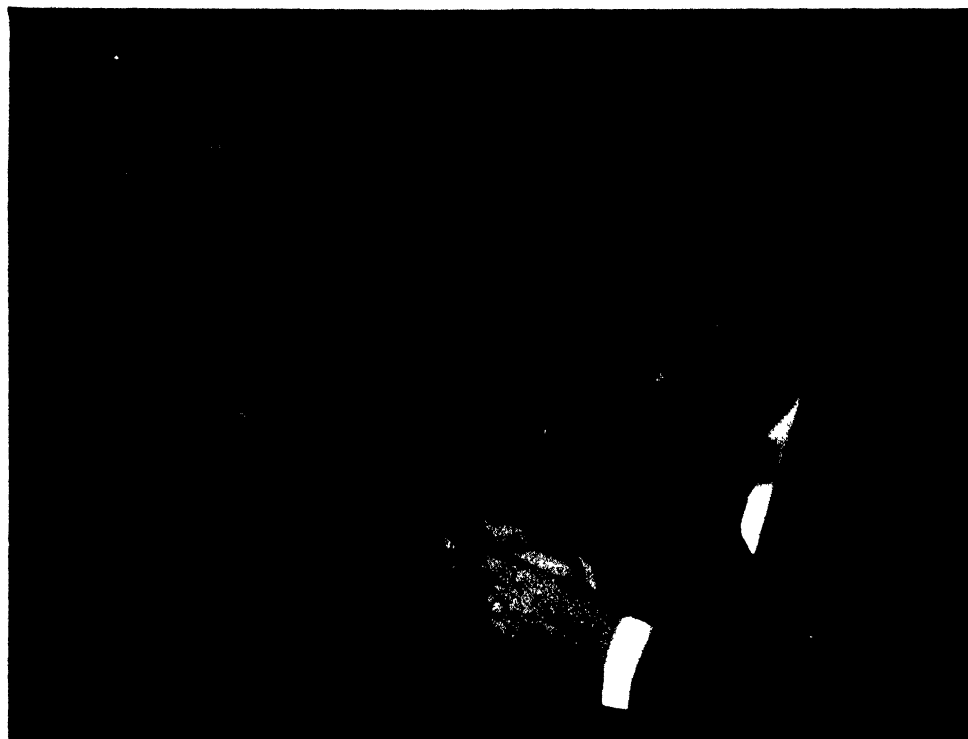
Mechanism. At the substation is an assembly of selector switches and telephone relays, together with three mechanically tuned relays. The latter are similar in construction to telephone receivers, but the crossarm diaphragm is replaced by tuned steel reeds, each vibrating at a definite frequency corresponding to the signals used by the dispatcher. Connected to contacts operated by the reeds are Knowles grid glow tubes. The reed contacts are in the grid circuit of the glow tubes, and therefore have to carry but a few micro-amperes of current, in order to operate the glow tubes. The plate current of the glow tubes, amounting to about twenty-five milliamperes, is used to operate telephone type relays.

The telephone in the substation rests on a prepared stand, with its receiver directly over a rubber orifice on a tubular arm. A solenoid is connected to this arm, and, upon operation of the ringing relay, the solenoid is energized and the arm lifts the receiver. Connected to the other end of this arm is a microphone, which in effect is the electrical ear of the device. The telephone may be lifted from the stand and used in the ordinary manner, without detaching or disconnecting any devices.

An ordinary ringing signal relay, of the type used for operating special loud gongs or signal devices, is installed by the telephone company, and furnishes the initiating means for the rest of the substation equipment. The relay makes contact when the bell rings, thus energizing the magnet, which lifts the arm on which the receiver rests, and putting the *televox* in operating position. After an interval of about thirty seconds, during which the substation buzzer sends out the station code at intervals, the actuating circuits will be opened by a timing device, unless the dispatcher sends one or more whistle blasts. This is to take care of wrong-number calls, which are inevitable as long as human beings use the telephone.

The *televox* was not designed to respond to the human voice, for the reason that a spoken word may have several interpretations, depending upon the sense in which it is used. Naturally, a machine cannot make such discriminations. It therefore was necessary to utilize a language which would be intelligible to *televox*—that is, a language of constant pitch. The response from the *televox* consists of a series of long and short notes, which are intelligible to the operator at the sending telephone.

Televox at Work. Means are available for reading meters, ascertaining the height of water in reservoirs, reading the temperature of trans-



Photos: Waddingham

The Televoz. Above, the mechanism of the invention. Below, the mechanical man, or robot, receives orders by whistles or pitchpipes.



Photo: Visual Education Service

PLEADING FOR THE LIFE OF TELL

Armgard, wife of William Tell, holds the bridle of the horse of Gessler while she begs the tyrant to spare her husband.

formers, or other devices; or, in fact, doing almost anything that needs to be done in the controlling of a distant electrical substation.

A televox started the operation of Chicago's new \$31,000,000 sewage-disposal plant. It also opened a new automatic power-distributing station, which is controlled by an operator at a switchboard three miles distant, for the New York Edison Company. This plant, with an ultimate capacity sufficient to light the homes of from 200,000 to 300,000 families, has not a human being in it. The output of the manless plant is 32,000 horse power, or about 320,000 man power.

Three automatons are in actual use at Washington, D. C., replacing watchmen at reservoirs which supply the people of Washington with water. By their buzzes, they tell the distant caller the height of the water, as shown by the gauge in the reservoir, and they also control the flow of water at his bidding.

Robot. This is a name, from the Czech word for *work* (*robot*), applied to a machine that seems as clever as a human being, or to a man whose work is so mechanical that it requires a minimum of intelligence. The term was popularized by a play called *R.U.R.* (*Rossum's Universal Robots*), in which the chief characters were mechanical men.

In times past, various automatons were constructed to perform feats such as playing musical instruments, turning a crank, or playing a game of chess. Most of these were toys, and were intended merely to amuse or mystify. If intelligence was involved in the action, it had to be supplied by a human agency. Modern robots, however, actually perform the work for which they are designed, and take the place of human workers. They are used to regulate the operation of machines, to steer and stabilize ships, to indicate the flow of the tides, and to control the temperature and humidity in many industrial processes. Recent discoveries in the field of electricity have enabled the mechanical man to see, hear, feel, smell, and talk. Hence it is possible to turn over to these mechanisms many monotonous and routine tasks.

Related to the robots, but differing from them in function, are various devices for performing mathematical operations (see *CALCULATING MACHINES*).

E.U.G.

[For an illustration of a modern robot, see *CARTOON*, page 1222.]

TELL, THE. *See *ALGERIA*.

TELL, WILHELM [*WILLIAM*], a legendary hero of Switzerland, whose story, though per-

not historically accurate, typifies the spirit that gave the land its freedom. According to the legend, Tell was a peasant of Uri, one of the Forest cantons. In 1307, when the country lay restive under the oppressive rule of the Austrians, he appeared one day in the market place of Altdorf. Here, on top of a pole, the Austrian bailiff Gessler had set up a cap, to which he commanded all Swiss to do homage. Tell refused to humble himself, and was told that he would be put to death unless he could save himself by shooting an apple from the head of his little son. This harrowing feat he accomplished, but when he confessed that a second arrow in his quiver was intended for the heart of Gessler, had the first not hit the mark but had killed his son, he was seized and placed in chains.

While he was being carried across a lake in the tyrant's boat, a great storm arose. In fear of his life, Gessler ordered the prisoner unbound, that he might help guide the boat. Tell, when his chains were loosed, sprang ashore, and soon sent an arrow into the heart of his persecutor. The story then connects itself with the revolt of the Forest cantons, in which Tell is given a conspicuous part. This popular tale is the basis of Schiller's drama *Wilhelm Tell*, and of an opera by Rossini.

TELLEGEN, LOU. See FARRAR, GERALDINE.

TELLURIUM. See CHEMISTRY (The Elements).

TELPOS, MOUNT. See URAL MOUNTAINS.

TELOGU, tel' oo goo. See INDIA (Languages).

TEMPE, VALE OF. See THESSALY.

TEMPERANCE, a term which signifies moderation in the exercise of the functions and privileges of life. "Let your moderation be known unto all men," is one of the oft-quoted teachings of the Apostle Paul. Moderation in eating and drinking, in the enjoyment of pleasures, in the expression of opinion, in work and in play, is good for all. Society has found it necessary to make many of its laws not for its moderate members, but for those who know no moderation; so it is sometimes necessary

to deny a people a privilege which would be harmless if moderately enjoyed. Restrictive laws in regard to personal conduct would not be necessary if every one were temperate in all his actions.

In the nineteenth century, temperance came to have a special meaning, referring to the use of alcoholic beverages. In fact, it came to mean, not moderation, but *total abstinence*. Nowadays, when the temperance movement is spoken of, one thinks involuntarily of the spread of prohibition.

Related Subjects. In connection with the general subject of temperance, readers may consult the following articles:

- Anti-Saloon League
- Good Templars
- License
- Local Option
- Prohibition
- Prohibition Party
- Woman's Christian
- Temperance Union

TEMPERATURE. In physics, *temperature* is a term used to describe the state of a body with reference to its ability to communicate heat to other bodies. When two bodies are brought into contact, and one transfers heat to the other, it is evident that the one receiving heat has a lower temperature than the other.

Temperature is measured by the thermometer, an instrument having a graduated scale of

degrees between two fixed points, the freezing point and the boiling point. There are in general use two scales, Centigrade (C.) and Fahrenheit (F.), the former having the freezing point at zero (0°) and the latter 32° above zero. The boiling points are, respectively, 100° and 212°. In theory, there is a point at which the vibrations constituting heat cease, and this point (273° below Centigrade zero) is known as the *absolute zero of temperature*. In practice, this point has never been reached, but it is used as a convenient standard in scientific calculations. In physical geography, temperature refers to atmospheric heat in various localities.

The temperature of the human body is normally 98.6° F.; it increases in fever and sunstroke (both of which see).

Earth's Extremes in Temperature. Between the hottest and the coldest temperatures ever officially recorded, there is a variation of 226.8° F.; an unofficial record that is accepted as reliable increases the variation to 234°. The



TELL MEMORIAL AT ALTDORF, SWITZERLAND

Historians will never agree upon the question of a real William Tell; but that he lives to-day in the spirit of Swiss love of freedom, the whole world recognizes.

coldest spot on earth, so far as is yet known, is at Verkhoiansk, Siberia, where, on January 15, 1885, the record showed 90.4° below zero; unofficially, in 1926, from the same place, came a record of 97.6° below zero. In this vicinity, warm weather is experienced for less than two months of the year, during which time the thermometer rises to about 80°. In the United States, the lowest temperature ever recorded was 65° below zero, at Miles City, Mont.

There are some exceedingly hot places in the world. The Italian meteorological station at Azizia, in the semi-desert plain of Jefara, North Africa, registered 136.4° in the shade, on September 13, 1922. Until that record was established, California's similar arid inland plain, Death Valley, held the world's heat record, with a temperature of 134°. This was at Greenland Ranch, on the edge of the Valley.

A.L.F.

Related Subjects. In connection with this brief discussion on temperature, the reader may consult the following articles in these volumes:

Centigrade	Heat
Climate	Sunstroke
Death Valley	Thermometer
Fever	Weather Bureau

TEMPERING, the process of imparting to metals, principally iron and steel, a required degree of hardness. In industry, the term is now almost exclusively restricted to hardening steel. Numerous methods of tempering are in use, but all depend upon the same principle—heating and cooling the metal. When iron or steel is heated red hot and suddenly cooled in water, it becomes hard and brittle. Cast iron is cooled so rapidly in the molds that it is brittle. On the other hand, if allowed to cool slowly, the iron or steel becomes soft and flexible. Red-hot steel rods, when allowed to cool slowly in the air, can be bent into any desired form, and are easily cut with a file or metal saw. Between these extremes there are many degrees of hardness, each adapting the metal to the special use for which it was designed.

To secure the requisite temper of a fine tool requires skill and experience. To illustrate, in tempering razors, the blade is forged, and when it is red hot, the edge is dipped in water for a moment to the depth of a half inch, then withdrawn, and quickly polished on an emery belt. This part of the blade becomes heated from the thicker part that was not immersed in the water. As the temperature rises, the polished surface changes color. By experience, the workman knows from the color when the required temperature is reached. He then plunges the blade into water. Oil or molten lead are also used for quenching steel, and they cool the metal more slowly, preventing the cracking that sometimes occurs in high-carbon steels when water is used.

The colors which the workman must note in the processes of tempering, and the finished tools of different hardness produced from the various colorings, are as follows:

Pale yellow (about 430° F.); hammer faces, planer tools, engravers' tools.

Straw yellow (about 460° F.); dies, drills, punches, etc.

Brown yellow (about 500° F.); plane irons, gouges, twist drills, and coopers' tools.

Light purple (about 530° F.); surgical instruments, augers, cold chisels.

Dark purple (about 550° F.); axes, springs, saws, screw drivers, and needles.

TEMPEST, THE. See SHAKESPEARE, WILLIAM (Synopsis of the Plays).

TEMPLARS, KNIGHTS, a military and religious organization founded at Jerusalem in 1119, by eight French knights who bound themselves by vows of obedience, poverty, and chastity, and took as their special work the protection of the Holy Sepulcher and the defense of pilgrims journeying to the sacred spot. The society grew rapidly in numbers, though at first only nobles or knights were admitted. Along with the special privileges granted the order by the Pope and various European rulers, it acquired many rich landholdings. At the height of its power, it is said to have possessed no fewer than 9,000 manors throughout Europe. Secular priests were admitted, to forward the specifically religious purposes, and subordinate members for the menial tasks, while the knights proper gave all their time to fighting.

Much of the history of the Crusades is but a history of the Templars. Their personal bravery was remarkable, and during the long attempt to hold Jerusalem for Christianity, over 20,000 of them met death on the field. The Latin kings of Jerusalem gave them quarters in the palace built on the site of Solomon's Temple; from this fact, the knights took their name. Fighting side by side with them when the struggle with the infidels was fiercest, and opposing them in bitterest rivalry when conditions were less compelling, was the other great military and religious order, the Knights Hospitalers of Saint John (which see).

The kings of Europe, impoverished by the Crusades, looked with envy upon the possessions of the Templars, and decided to gain them for themselves. King Philip IV of France and Pope Clement V were the leaders of this opposition, which culminated in 1307 in the death, by torture, of the grand master and many knights, and, in the course of the next few years, the disbanding of the order in most countries. Crimes of all sorts were laid at the door of the order, to give a semblance of justice to the procedure. Such of the property as was not seized by the sovereigns was turned over to the rival order, the Hospitalers, which survived into the nineteenth century.

Modern Knights Templar. One of the branches of Freemasonry is the order of Knights Templar, and to become a member of this order, one must be a Master Mason and Royal Arch Mason. See MASONRY.

TEMPLE, a building for religious worship, used from primitive times, when only a cave sheltered the members of the cult and the images of their god or gods. Crude though the early temples were, the altar stones and sacred images evidenced the highest skill and art attained by the people. All through the ages, temples were constructed which represented the height of culture attained by the peoples who built them. Among some sects, the temple was believed to be the home of the deity that was worshiped. The term is also used to designate a shrine; Solomon's Temple, the famous center of worship of the Jews (see below); and the meeting places of several fraternal orders.

Temple of Solomon, a beautiful building conceived by David, which became the center of Jewish worship from the time of Solomon, son of David, to the destruction of Jerusalem by the Romans. The site, on the hill of Zion, was chosen by David, who also gathered the materials for the structure. The walls, sixty cubits long (a cubit was eighteen inches), twenty wide, and thirty high, were of stone, hewn and polished at the quarries, so that there was no sound of hammer or tool of iron in the building (*I Kings* vi, 7). The whole edifice, inside and out, was covered with costly woods, overlaid with gold. Within were the Holy of Holies, containing the Ark of the Covenant, and the holy place, containing the altar of incense, the table of shewbread, and the golden candlestick. In front was a porch, ten cubits wide, with an imposing pillar on either side of the entrance. Surrounding the building on three sides were corridors and cells, rising three stories in height. The Temple faced the east, and before it stood the brazen altar of burnt offering.

The magnificence of Solomon's Temple, its impressive priesthood, and its costly sacrifices centralized the worship of the people, and other places of worship disappeared. It was destroyed by Nebuchadnezzar, in 586 B.C. Zerubbabel's temple, erected after the Exile, was far less splendid than Solomon's. In it the Holy of Holies was empty, the Ark having been lost at the time of the Captivity. This temple was replaced (20 B.C. to 64 A.D.) by the costly temple of Herod, in which Jesus walked and taught, and which, in its turn, was destroyed by the Romans in A.D. 70, when Titus captured Jerusalem, after a siege.

TEMPLE, TEX. See TEXAS (back of map).

TEMPLE OF DIANA. See DIANA, subhead.

TEMPLE OF SOLOMON. See SOLOMON; TEMPLE, subhead.

TEMPLE UNIVERSITY. See PHILADELPHIA (Educational Facilities).

TEMPO, a musical term meaning *time*, derived from the Italian, and expressing the rate of movement in which a musical composition is to be played. The degrees of time are divided into two classes—those which suggest the rate of movement, such as *lento* (slow), *adagio* (gentle), *moderato* (moderately), *presto* (quick), etc., and those which represent a quality which may influence the time, such as *vivace* (lively), *animato* (cheerful). See MUSIC (A Course of Lessons).

TEMPORAL BONES, two of the eight bones of the head (which see).

TENACITY, *te nas' ih tih*, a property possessed by all matter. It is the resistance which substances exert to being pulled or torn apart, and depends upon the material, the shape of the body, the temperature, and the length of time the weight is applied. The degree of tenacity a body possesses is its *tensile strength*. Tenacity is measured in terms of the weight necessary to break the body. Hollow bodies have greater relative resistance than have solids. The bones of animals, the quills of bird feathers, bamboo cane, and cornstalks are illustrations. A cable of many wires woven together is much stronger than a solid rod of the same size and material, because the sum of the tenacities of the wires is greater than that of the rod. Among the metals, steel (piano wire) has the greatest tenacity, and lead is among the weakest metals, in this respect. In the making of telegraph and cable wires, suspension bridges, and other structural devices, a knowledge of tensile strength is of primary importance. See MATTER; STRENGTH OF MATERIALS. A.L.F.

TENANT, one who has temporary use and occupation of lands or buildings belonging to another. The terms and period of time are defined in a written agreement, known as a *lease*, signed by owner and tenant. Tenancy for less than a year may be by oral agreement.

The relation of landlord and tenant had its origin in the feudal system of the Middle Ages, and some of the feudal obligations of both the lessor and lessee still survive in the present laws. Laws vary in different states and countries, but there are certain general provisions which apply in most cases. The landlord must defend his tenant's title; whether the latter may sublease without the consent of the landlord is a matter of agreement. The tenant is usually responsible for repairs made necessary by the misuse of the premises, but specific agreements in regard to repairs are usually included in the lease. If the buildings are rendered untenable by fire, the landlord may terminate the lease; or, if he does not make repairs within thirty days, the lease ceases to be binding.

If the tenant fails to pay the stipulated rent or does not adhere to other terms of the lease, the landlord may terminate the lease and may legally enter the premises, expel the tenant, and remove his goods, but the lease still holds. The lessor also has a lien upon the household goods of the tenant, as security for rent. He may sue for any rent that may be due, by the terms of the lease; the tenant may be responsible under the contract for the attorney's fees and other costs. The heirs, successors, or administrators of both tenant and landlord are bound by the terms of the lease.

A *tenant at will* is one who occupies property for an indefinite period, which may be ended at any time desired, by either landlord or tenant. The latter is entitled to a notice of removal, generally sixty days before the day ending the term of occupancy. If he has growing crops on the rented land, he may enter later and gather them.

A *tenant at sufferance* is one who occupies property without the express consent of the owner, or after his term of possession has expired. He may be ejected, at any time, by the landlord.

Derivation. The word *tenant* is derived from the Latin *teneo*, which means *I hold*.

Related Subjects. The reader is referred to the following articles in these volumes:

Contract Law Lease Real Estate

TEN COMMANDMENTS. See DECA-LOGUE.

TENDER, a term in law relating to payment of debt. See LEGAL TENDER.

TENDERFOOT. See BOY SCOUTS.

TENDON OF ACHILLES. See ACHILLES, subhead.

TENDONS, *ten' dunz*, OR **SINEWS**, *sin' uze*, strong, white, fibrous cords which attach the muscles to the bones. They may be round, or long and flat, and are composed of close, tough, parallel fibers. The tapering end of each muscle merges directly into one end of a tendon, the other end of which is attached to the bone in a distinct groove in the bone substance. At this extremity, too, the tendons are firmly embedded in the periosteum, or protective sheath which encases the bones. It is by means of the tendons that the movements of the muscles are transmitted to the bones. See BONE; ACHILLES, subhead; MUSCLES. K.A.E.

TENEMENT, a name applied to any house constructed for the occupancy of two or more families, the legal definition as to the number of families varying somewhat in different cities. The term is popularly, though not legally, restricted to quarters occupied by the very poor people of a city. Because of laxity in regard to building regulations, many cities have permitted certain sections to decline into so-called slum districts. Old houses in such districts,

from which the better classes have withdrawn, have been converted into tenements, and new ones have been erected with inadequate regard for the health and safety of the occupants. Large families are crowded into small, dark, ill-smelling rooms, which become centers not only of disease, but of crime. A deplorable number of young people and children learn vicious habits in such homes, because there is no adequate provision for privacy, while lack of light, air, and sanitation lowers the health standards, brings about epidemics, and causes an excessive death rate among babies.

Such conditions as these, which Jacob A. Riis describes so graphically in his *How the Other Half Lives*, are responsible for the movement to better the lot of the tenement people.

Tenement-House Regulation. The chief subjects of tenement-house regulation are light and ventilation, protection against fire, water supply, sanitary standards, and overcrowding. The movement for better housing conditions is engaging the attention of city governments and social workers everywhere. In New York City, the problem has been attacked by the state legislature, but building and housing regulations are usually prescribed by city ordinances. The remedies include legislation against insanitary property, the construction of suburbs, the tearing down or improvement of existing tenements, and the building of new ones according to specified rules, aided by tax exemption and the regulation of rents (see CITY PLANNING). Health boards, sanitary inspectors, building commissions, and similar agencies are appointed to see that the laws are obeyed. L.L.B.

Origin. The word *tenement* is derived from the Latin *tenementum*, meaning a *holding*.

TENERIFFE, *ten ur if'*, the name of the largest island and town of the Canary Islands (which see).

TENIERS, *teh nya'*, in English, *ten' yurz*, the family name of two noted Flemish painters, father and son, both of whom excelled in the portrayal of scenes from everyday life.

David Teniers, THE ELDER (1582-1649), was born at Antwerp. He was a pupil of Rubens. His paintings, especially those presenting rustic games and weddings, are noted for their fidelity to nature, their charm of color treatment, and excellence of composition. They include *Peasants Carousing in Front of a Tavern* (Darmstadt Gallery), *A Dutch Kitchen*, now in the Metropolitan Museum, New York, and *Playing at Bowls*, which is in the National Gallery, London.

David Teniers, THE YOUNGER (1610-1690), who excelled in all the qualities that characterized his father's work, was called "the prince of genre painting." He often introduced cats or monkeys into his small canvases, all active and picturesque, although his best works are those with the fewest figures. The younger Teniers was born at Antwerp and received

his first art instruction from his father. He rose quickly in popular favor, and won the patronage of leading noblemen of his country. In 1651 he took up his residence at Brussels as court painter; here he remained for the rest of his life. Few artists equaled him in the charm with which he depicted open-air life. Often he would participate in the merrymakings, so as to obtain an intimate picture

of the people whose lives he has perpetuated in hundreds of paintings, distributed among the great galleries of Europe. Among his canvases are *A Merry Repast* (Berlin Museum), *Peasants' Dance*, (Pinakothek, Munich), *The Barber Shop* (in Cassel), and *Marriage Festival*, the latter a possession of the Metropolitan Museum. He was the founder of the

Academy in the city of Brussels



TENNESSEE, *ten eh see'*, is a land of contrasts. Coupled with an advanced system of education is a state law forbidding the teaching of evolution; in the birthplace of the original Ku-Klux Klan are some of the finest negro schools, universities, and institutions in the nation. On one side of the state are the highest mountain peaks east of the Rockies; on the other are the bottomlands of the Mississippi, subject to its bounty and to its destructive floods. One of the South-Central states of the American Union, Tennessee is popularly known as the VOLUNTEER STATE, because 30,000 volunteered for the Mexican War, when the government asked for only 2,800.

Size and Location. Tennessee has more states touching its borders than any other state of the Union except Missouri. The Mississippi River is its western boundary, and separates it from portions of Arkansas and Missouri. The greater part of its straight northern border line adjoins Kentucky, with a small stretch at the eastern end meeting the Virginia line. Mississippi, Alabama, and Georgia touch it on the south, while the state of North Carolina bounds it on the east. Having an area of 42,022 square miles, of which 335 square miles are water, it ranks thirty-fourth in size among the states. Its area is nearly equal to that of the state of Virginia.

People. Although much of the state is mountainous and the large cities are comparatively few, Tennessee is thickly settled, ranking nineteenth among the states in population in 1920. In that year, the inhabitants numbered 2,337,885, of whom over nineteen per cent were negroes and eight-tenths of one per cent were of foreign birth, chiefly Russian, German, Italian, and English. The average density of the population was 56.1 per square mile, over one and one-half times the average for the United States. The Federal estimate of the population for July, 1928, was 2,502,000. Only

26.1 per cent of the inhabitants live in cities and towns, the largest of which are Memphis, Nashville (the capital), Knoxville, Chattanooga, Johnson City, Jackson, and Kingsport. These cities range in population from 190,200 to 15,000 (late estimate).

The Baptist and Methodist Churches have the largest number of members.

Education. Public schools are administered by county boards of education, supervised by a state department of education, with a commissioner who is a member of the governor's cabinet. The state board consists of the governor, the commissioner, and nine members appointed by the governor. In addition to the regular school fund, derived from state and county taxation, the schools have the interest on the permanent state fund and thirty-three and one-third per cent of the gross revenue of the state. A ten-per-cent sales tax on tobacco also goes into the school fund. In 1927 the legislature authorized the expenditure of \$1,000,000 for repair and construction of rural schoolhouses.

There are separate schools for white and colored pupils, and one or more high schools are maintained in each county. In 1914 compulsory education was made state-wide. Over ninety per cent of the total population of school age is enrolled in schools, and illiteracy is rapidly decreasing. The minimum school term is eight months. Advancement has been made in the education of the secluded eastern mountaineers, who formerly were cut off from such advantages.

University of Tennessee. Located at Knoxville, this is one of the largest state institutions in the South. It was first chartered in 1794 as Blount College, and became the University of Tennessee in 1879. The university has an extension division and a regular summer quarter. The colleges of medicine, pharmacy, and dentistry are at Memphis. The Junior College is at Martin.

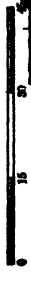
TENNESSEE

Adams, (G1).....	600	Byrdstown, (L1)...	125	Denmark, (C3)....	300	Goin, (O2).....	400	Lenoir City, (N3)..	4,210
Adamsville, (E4)..	500	Cades, (D3).....	100	Denver, (F2)....	200	Goodlettsville, (H2)	1,000	Lenox, (B2).....	250
Aetna, (G3).....	180	Calderswood, (O3)	250	De Rossett, (L3)...	150	Gordonsburg, (G3)	829	Leoma, (G4).....	410
Afton, (O2).....	200	Calhoun, (M4)....	300	Devonia, (N2)....	150	Gordonsville, (K2)	278	Lewisburg, (H4)...	2,711
Alamo, (C3).....	720	Camden, (E2)....	800	Diana, (H4).....	150	Gorman, (F2).....	400	Lexington, (E3)...	1,792
Alcos, (O3).....	3,358	Campaign, (K3)...	200	Dickson, (G2)....	2,263	Grand Junction, (C4)	497	Liberty, (K2)....	285
Alexandria, (J2)...	510	Campbellsville, (G4)	150	Difficult, (K2)....	200	Granville, (K2)....	230	Lillydale, (L1)...	180
Algood, (L2).....	651	Capleville, (B4)...	250	Dixon Springs, (J2)	290	Graysville, (L4)...	786	Limestone, (Q2)...	450
Allardt, (M2)....	250	Carter, (R2).....	300	Donelson, (H2)...	200	Greenback, (N3)...	350	Linden, (F3).....	400
Allens Creek, (F4)...	707	Carters Creek, (H3)	160	Double Springs, (K2)	150	Greenbrier, (H2)...	518	Littleton, (G3)...	200
Allisona, (H3)....	200	Carthage, (K2)....	920	Dover, (F2).....	400	Greenfield, (D2)...	3,775	Liveston, (L2)...	1,215
Allons, (L2).....	100	Caryville, (N2)....	450	Dowelltown, (K2)...	200	Guild, (K4).....	1,474	Lobelville, (F3)...	400
Altamont, (K4)....	114	Cedar Grove, (D3)	200	Doyle, (K3).....	450	Guys, (D4).....	100	Lone Mountain, (O2)	350
Alton Park, (L5)...	3,020	Cedar Hill, (G1)...	600	Dresden, (D2)....	1,007	Halls, (C3).....	1,400	Lookout Mountain, (L5).....	623
Anderson, (K5)....	150	Celina, (L1).....	420	Duck River, (G3)...	100	Hampshire, (G3)...	250	Loretto, (G4)....	500
Andersonville, (N2)	150	Centerville, (G3)...	882	Ducktown, (N4)...	1,500	Hampton, (R2)...	600	Loudon, (N3)....	3,000
Antioch, (H2)....	250	Chapel Hill, (H4)...	1,000	Dukedom, (D2)....	300	Hanging Limb, (B2)	150	Louisville, (N3)...	300
Ardmore, (H4)....	350	Chapmansboro, (G2)	200	Dunlap, (L4)....	1,465	Harms, (H4)....	150	Lucy, (B4).....	300
Arlington, (B4)....	494	Charleston, (M4)...	400	Durhamville, (B3)...	150	Harriman, (M3)...	4,019	Luray, (D3)....	200
Arthur (O1).....	200	Charlotte, (G2)...	200	Dyersburg, (C2)...	6,444	Harrison, (L4)....	260	Luttrell, (O2)....	500
Ashland City, (G2)	649	Chattanooga, (L4)	57,895	Eads, (B4).....	105	Hartford, (F3)...	1,200	Lutts, (F4).....	340
Ashport, (B3)....	200	Cherry, (B3).....	100	Eagleville, (H3)...	500	Hartsville, (J2)...	450	Lyles, (G3).....	350
Aspen Hill, (G4)...	200	Chestfield, (E3)...	100	East Chattanooga, (L4)	4,720	Haysville, (J1)...	1,023	Lynchburg, (J4)...	365
Athens, (M4).....	2,580	Chestnut Mound, (K2).....	200	Eastlake, (L5)....	12,500	Heiskell, (N2)....	200	Lynnville, (G4)...	552
Atoka, (B4).....	245	Chewalla, (D4)....	100	Eastland, (L3)....	598	Helenwood, (M2)...	300	McConnell, (D2)...	150
Atwood, (D3)....	350	Christiana, (J3)...	780	Eaton, (C3).....	250	Henderson, (D4)...	1,181	McEwen, (F2)....	635
Auburntown, (J3)...	220	Chuckey, (O2)....	400	Edenwold, (H2)...	150	Hendersonville, (H2)	350	McKenzie, (E2)...	1,630
Baileyston, (O2)...	169	Church Hill, (Q1)...	450	Edith, (B3).....	100	Henning, (B3)....	495	McLemoresville, (D3).....	250
Banner Springs, (M2)	100	Clairfield, (O1)...	300	Eidson, (P1).....	200	Henry, (E2).....	230	McMinnville, (K3)	2,814
Barlett, (B4)....	271	Clarksburg, (E3)...	250	Elbridge, (C2)...	350	Henryville, (G4)...	150	Macon, (B4).....	200
Bath Springs, (E4)...	200	Clarksville, (G1)...	8,110	Elgin, (M2).....	100	Hermutage Springs, (K1).....	100	Madisonville, (N3)	850
Baxter, (K2).....	521	Cleveland, (M4)...	6,522	Elkton, (H4).....	212	Hickman, (K2)....	250	Malesus, (D3)....	100
Beacon, (E3).....	150	Clifton, (F4).....	700	Elk Valley, (N2)...	200	Hickory Point, (G2)	150	Manchester, (J4)...	1,114
Beans Creek, (J4)...	150	Clifty, (L3).....	729	Elora, (J4).....	250	Hickory Valley, (C4)	200	Mansfield, (E2)...	150
Bearden, (N3)....	200	Clinton, (N2)....	1,409	Elva, (M1).....	100	Hilham, (L2)....	250	Martel, (N3)....	150
Beardstown, (F3)...	150	Coal Creek, (N2)...	1,204	Embsreeville, (R2)...	300	Hillsboro, (J4)...	150	Martin, (D2)....	2,837
Beech Bluff, (D3)...	150	Coalfield, (N2)...	300	Emmett, (R1)....	250	Hillsdale, (F2)...	150	Maryville, (O3)...	3,739
Beechgrove, (J3)...	250	Coalmont, (K4)...	250	Emory Gap, (M3)...	150	Hixson, (L4)....	250	Mascot, (O2)....	2,500
Belfast, (H4)....	123	Coble, (F3).....	250	Englewood, (M4)...	1,271	Hobdenwald, (F3)...	742	Mason, (C4)....	387
Bellbuckle, (J3)...	471	Coldwater, (H4)...	100	Enville, (E4)....	300	Holladay, (E3)...	177	Maur City, (C3)...	452
Bells, (C3).....	920	Collingwood, (F4)...	698	Erie, (M3).....	380	Hollow Rock, (E2)...	198	Mayland, (L2)...	164
Bellwood, (J2)....	100	Columbia, (G3)...	5,526	Ern, (F2).....	855	Holtland, (H3)...	200	Maynardville, (O2)	350
Belvidere, (J4)....	150	Como, (D2).....	150	Ernst, (F2).....	2,965	Hornbeak, (C2)...	400	Meadow, (N3)....	100
Bemis, (D3).....	1,000	Conasauga, (M4)...	100	Estill Springs, (K4)	250	Hornsby, (D4)...	303	Medina, (D3)....	358
Benton, (M4)....	525	Concord, (N3)....	500	Etowah, (M4)....	2,516	Humboldt, (D3)...	3,913	Medon, (D4)....	114
Bethel, (G4).....	200	Cookeville, (K2)...	2,395	Euchee, (M3)...	150	Huntingdon, (E3)...	1,221	Memphis, (A4)...	162,351
Bethel Springs, (D4)	400	Cook Place, (L2)...	200	Eva, (F2).....	300	Huntingdon, (J4)...	123	Michie, (E4)....	200
Bethpage, (J2)....	98	Copperhill, (N5)...	1,102	Evansville, (M3)...	300	Huntsville, (N2)...	300	Middleton, (D4)...	321
Big Rock, (F1)....	197	Cordova, (B4)....	300	Fairfield, (J3)...	150	Hurricane Mills, (F3).....	100	Midway, (P2)....	200
Big Sandy, (E2)...	603	Cornersville, (H4)	314	Fall Branch, (Q2)...	140	Hustburg, (F3)...	150	Milan, (D3)....	2,057
Big Spring, (M4)...	150	Corryton, (O2)...	400	Farner, (N4)....	150	Indian Dound, (F2)	150	Milledgeville, (E4)	250
Birchwood, (M4)...	200	Cosby, (P3).....	450	Fayetteville, (H4)	3,629	Idelwild, (D2)...	150	Millington, (B4)...	300
Blaineville, (O2)...	150	Cottagesgrove, (F2)	210	Fingert, (D4)....	350	Indian Springs, (R1)	300	Millington, (B4)...	657
Blanche, (H4)....	200	Covington, (B3)...	3,410	Finger, (D4)....	350	Iron City, (F4)...	350	Milton, (J3)....	100
Bloomington, (R1)	200	Cowan, (J4).....	600	Fishdam, (R1)...	150	Isabella, (N4)....	500	Minor Hill, (G4)...	340
Bloomington Springs, (K2).....	250	Crab Orchard, (M3)	300	Fishland, (R1)...	160	Jacksboro, (N2)...	638	Mint, (N3)....	200
Blountville, (R1)...	250	Crandall, (S1)....	150	Flat Creek, (J4)...	150	Jacks Creek, (D4)...	250	Miston, (B2)....	400
Bluff City, (R2)...	524	Crawford, (L2)...	300	Flat Woods, (F4)...	150	Jackson, (D3)....	18,860	Mitchellville, (H1)	161
Bodenham, (G4)...	100	Crestview, (G4)...	250	Flintville, (J4)...	300	Jamestown, (M2)...	500	Mitchell, (F1)...	250
Bogota, (C2).....	200	Crockett Mills, (C3)	300	Flynns Lick, (K2)...	150	Jasper, (K4).....	728	Mohawk, (P2)....	300
Bold Spring, (F3)...	100	Cross Plains, (H1)...	300	Forest Hill, (B4)...	300	Jealousy, (K4)....	180	Monroe, (L2)...	180
Bolivar, (D4)....	1,031	Crossville, (L3)...	948	Fosterville, (J3)...	300	Jefferson City, (Q2)	1,414	Monteagle, (K4)...	600
Boma, (K2).....	150	Crum, (E4).....	200	Fountain City, (O2)	500	Jefferson City, (P2)	1,414	Monterey, (L2)...	1,445
Bon Air, (L3)....	489	Cumberland City, (F2).....	400	Fountain Head, (J1)	200	Jellico, (N1)....	1,878	Mooreburg, (P2)...	250
Bon Aqua, (G3)....	200	Cumberland Furnace, (G2).....	300	Fowlkes, (C3)....	339	Johnson City, (Q2)	12,442	Mooreville, (L1)...	140
Booths Point, (B2)	200	Cumberland Gap, (O1).....	304	Frankewing, (H4)...	200	Johnsons Grove, (C3)	100	Mooreville, (P2)...	250
Boysds Creek, (O3)...	100	Cummingsville, (L3)	100	Franklin, (H3)....	3,123	Johnsonville, (F2)	350	Morley, (N1)....	150
Braden, (B4).....	150	Cunningham, (G2)...	150	Friendship, (C3)...	487	Jonesboro, (R2)...	815	Morrison, (K3)...	271
Bradford, (D2)....	507	Curry, (C3).....	100	Friendsville, (N3)	500	Juno, (D3).....	250	Morristown, (F2)...	5,875
Bradyville, (J3)...	200	Cypress Inn, (F4)...	200	Fruitland, (D3)...	150	Keeling, (C4)....	150	Moscow, (C4)....	314
Braxton, (J3)....	100	Daisy, (L4).....	400	Fulton, (B3)....	100	Kelso, (J4).....	250	Mosheim, (Q2)...	500
Brazil, (C3).....	150	Dancysville, (C4)...	100	Gadsden, (D3)....	300	Kenton, (C2)....	804	Moss, (K1).....	230
Brentwood, (H2)...	250	Dandridge, (P2)...	439	Gainesboro, (K2)...	351	Kerrville, (B4)...	220	Mountain City, (S2)	724
Briceville, (N2)...	1,200	Danville, (F2)....	150	Gallatin, (J2)....	2,757	Ketchall, (K4)...	592	Mount Juliet, (H2)	810
Brighton, (B4)....	265	Darden, (E3).....	250	Galloway, (B4)....	200	Kingsport, (Q1)...	5,692	Mount Pleasant, (G3).....	2,093
Bristol, (R1)....	8,047	Davidson, (L2)....	400	Gallaway, (B4)....	200	Kingsport, (N3)...	516	Mt Vernon, (N4)...	150
Brotherston, (L2)...	190	Daylight, (K3)....	200	Gardner, (D2)....	200	Kingston Springs, (G2).....	150	Mulberry, (J4)...	200
Brownsville, (C3)...	3,062	Dayton, (L4)....	1,701	Garland, (B3)...	119	Knoxville, (O3)...	77,818	Murford, (B4)...	382
Bruceston, (E2)...	1,000	Decatur, (M3)....	142	Gassaway, (K3)...	150	Lafayette, (J1)...	547	Murfreesboro, (J3)	5,367
Brunswick, (B4)...	400	Decaturville, (E3)...	315	Gates, (C3).....	393	La Follette, (N2)...	3,056	NASHVILLE, (H2).....	118,342
Brush Creek, (J2)...	350	Decherd, (J4)....	815	Georgetown, (M4)	150	La Grange, (C4)...	248	Neptune, (G2)...	100
Brushy Mountain, (N2).....	858	Deer Lodge, (M2)...	150	Germantown, (B4)	450	Lancing, (M2)....	250	Neshoba, (B4)....	263
Buchanan, (E2)....	200	Defeated, (K2)...	180	Gerrit, (M2)....	200	Lascassas, (J3)...	250	Neva, (S2).....	120
Buena Vista, (E3)...	150	Delano, (M4)....	150	Gibson, (D3)....	249	Laurel Bloomery, (S1).....	200	Newbern, (C2)...	1,767
Buffalo, (F3)....	100	Dellrose, (H4)...	200	Gillies Mills, (F4)...	150	La Vergne, (H2)...	200	Newcomb, (N1)...	500
Bullsgap, (P2)....	1,000	Del Rio, (P3).....	250	Gladeville, (J2)...	150	Lawrenceburg, (G4).....	2,461	New Market, (O2)...	700
Bumpus Mills, (F1)	250			Glass, (C2).....	250	Lebanon, (J2)....	4,084	New Middleton, (J2)	300
Buntyn, (B4)....	500			Gleason, (D2)....	1,474			Newport, (P3)....	2,753
Burns, (G2).....	300			Glendale, (H3)...	190				
Butler, (S2).....	578			Glenmary, (M2)...	500				
Byington, (N3)...	250			Glimp, (B3).....	100				



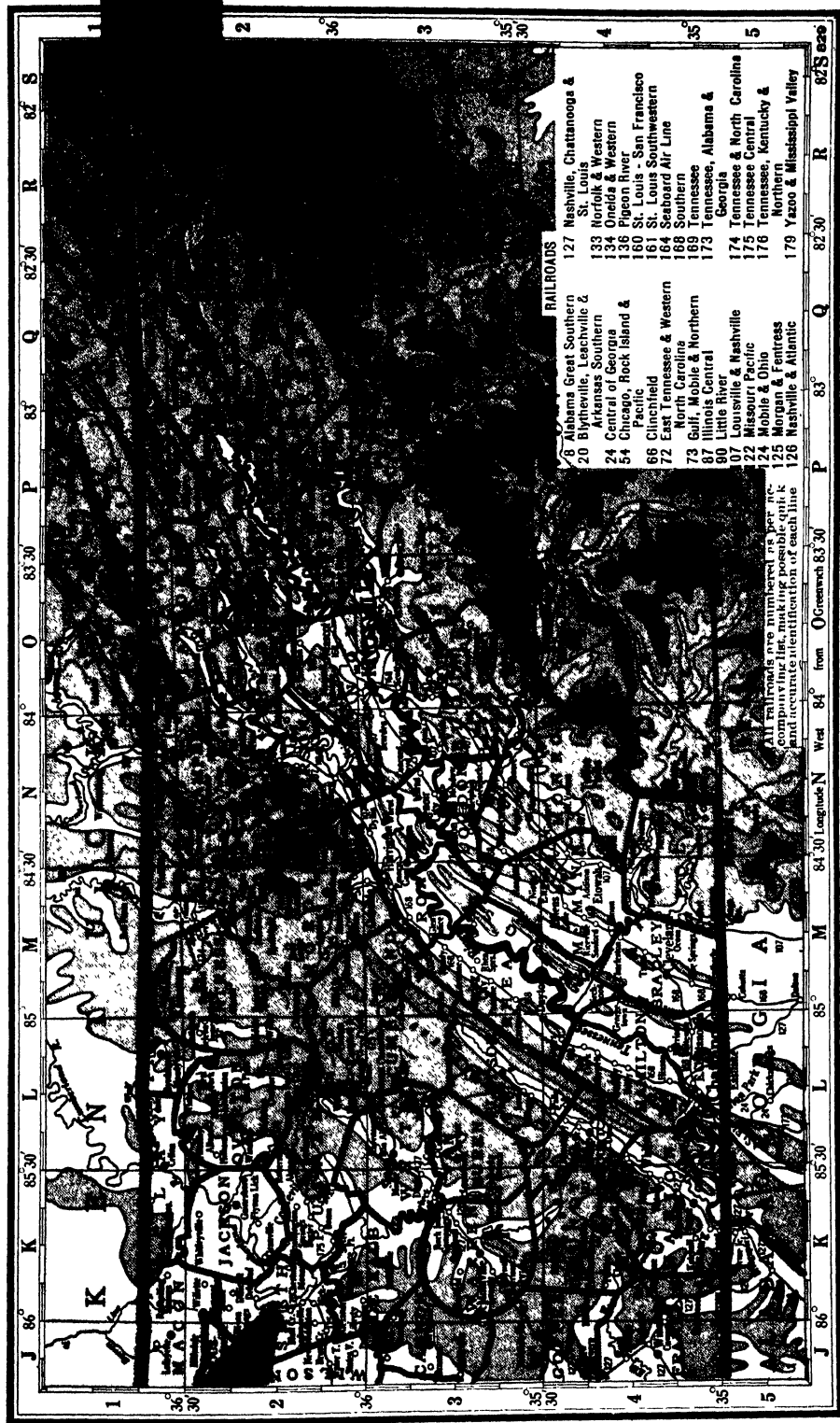
TENNESSEE

SCALE OF MILES



- State Capitals
- County Seats
- Railroads
- Railroads not in operation
- National Parks
- National Monuments

A 90° B 89°30' C 89° D 88°30' Longitude E West 88° from F Greenwa 87°30' G 87° H 86°30' J 86° K 85°



Engraved and printed expressly for THE WORLD BOOK
How to Read a Map: See page xvi, facing text page L



TENNESSEE *Continued*

	Pittsburg Landing, (E4).....	400	Russellville, (P2)...	300	Stantonville, (E4)...	250	Vildo, (C4).....	120
2)...	300 Pleasant Hill, (L3)...	100	Rutherford, (D2)...	792	Statesville, (J2)...	150	Viola, (K3).....	183
(O2)	750 Pleasant Shade, (K2)	200	St. Bethlehem, (G1)	150	Stewart, (F2).....	300	Vonore, (N3).....	450
	467 Pleasant View, (G2)	350	St. Clair, (P2).....	250	Straight Fork, (N2)	150	Waldensia, (M3)...	250
3)...	300 Pocahontas, (D4)...	250	St. Elmo, (L4)....	3,890	Strawberry Plains, (O2).....	450	Walling, (K3).....	200
	200 Portland, (H1).....	869	St. Joseph, (F4)...	327	Sugar Tree, (E3)...	200	Walnut Grove, (E4)	450
	300 Powell Station, (N2)	300	Sale Creek, (L4)...	300	Summertown, (G4)	400	Walterhill, (J3)...	250
	400 Prospect Station, (G4).....	250	Saltito, (E4).....	360	Summitville, (J3)...	250	Warren, (C4).....	200
ooga,	250 Pruden, (O1).....	200	Samburg, (C2)....	140	Sunbright, (M2)...	300	Wartburg, (M2)...	250
	2,196 Pulaski, (G2)....	2,780	Santa Fe, (G3)....	300	Surgoinsville, (Q2)...	400	Wartrace, (J3)...	619
...	220 Puryear, (E4)....	325	Sardis, (E4).....	419	Sweetwater, (N3)...	1,972	Washburn, (Q2)...	240
	1,552 Quebec, (K3)...	150	Saulsberry, (C4)...	190	Sylvia, (G2).....	100	Watauga, (R2)...	200
	150 Raleigh, (B4)....	287	Saundersville, (H2)	100	Taft, (H4).....	150	Watauga Valley, (R2).....	250
	350 Ramer, (D4)....	250	Savannah, (E4)...	758	Talbott, (P2)....	200	Watertown, (J2)...	933
...	150 Randolph, (B3)...	153	Scotts Hill, (E3)...	123	Tasso, (M4).....	150	Waverly, (F2)...	1,054
	1,376 Rankins Depot, (P2)	150	Selmer, (D4)....	546	Tate, (P2).....	250	Waynesboro, (F4)...	700
	140 Ravenscroft, (L3)...	509	Sequatchie, (K4)...	200	Tazewell, (O2)....	424	Weavers Store, (F1)	150
	100 Readyville, (J3)...	200	Sevierville, (O3)...	776	Telford, (Q2)....	450	Westmoreland, (J1)	357
(H2)	3,000 Reagan, (E3)....	350	Sewanee, (K4)....	500	Tellico Plains, (N4)	1,220	Westpoint, (F4)...	312
(N2)	777 Redboiling Springs, (K1).....	750	Seymour, (O3)...	200	Temperance Hall, (K2).....	200	Westport, (E3)...	250
	943 Rhea Springs, (M3)	300	Sharon, (D2)....	506	Tennessee City, (F2)	250	Wheat, (N3)....	250
	200 Rheatown, (Q2)...	132	Sharps Chapel, (O2)	300	Tennessee Ridge, (F2).....	200	White Bluffs, (G2)...	449
	500 Riceville, (M4)...	500	Shawnee, (O1)....	200	Thomasville, (G2)...	100	White House, (H2)	300
	522 Richard City, (K4)	398	Shelbyville, (J4)...	2,912	Thomasons Station, (H3).....	200	White Pine, (P2)...	421
	150 Richmond, (H4)...	50	Sherwood, (K4)...	350	Tigrett, (C3)....	250	Whitesburg, (P2)...	400
	100 Rickman, (L2)....	100	Shop Spring, (J2)...	150	Timothy, (L2)....	200	Whites Creek, (H2)	200
	150 Ridgely, (C2)....	910	Signal Mountain, (L4).....	441	Tiptonville, (C2)...	1,050	Whiteside, (L5)...	350
	250 Ridgetop, (H2)...	126	Silerton, (D4)....	200	Toone, (D4).....	294	Whiteville, (C4)...	749
(D2)	200 Right, (E4).....	150	Silver Point, (K2)...	580	Townsend, (O3)...	800	Whitleyville, (K2)...	250
	150 Ripley, (B3)....	2,070	Slayden, (G2)....	158	Tracy City, (K4)...	2,669	Whitlock, (E2)...	150
	4,730 Riverview, (L4)...	209	Smithville, (K3)...	687	Trade, (S2).....	200	Whitwell, (K4)...	3,000
(P3)	300 Rives, (C2).....	495	Smyrna, (H3)....	463	Trenton, (D3)....	2,751	Whitthorne, (D3)...	200
	429 Roan Mountain, (R2).....	300	Sneedville, (P1)...	500	Trezevant, (D3)...	587	Wilder, (L2).....	300
	250 Robbins, (M2)....	400	Soddy, (L4).....	1,173	Trimble, (C2)....	781	Wildersville, (E3)...	425
	240 Rockford, (O3)...	300	Somerville, (C4)...	1,106	Triune, (H3).....	180	Willette, (K2)....	250
	250 Rock Island, (K3)...	200	South Fulton, (D2)	1,650	Troy, (C2).....	516	Williamsport, (G3)	200
(4)	560 Rockwood, (M3)...	4,652	South Pittsburg, (K4).....	2,356	Tullahoma, (J4)...	3,479	Williston, (C4)...	250
	1,024 Rocky River, (K3)	150	Southside, (G2)...	310	Twomey, (G3)....	100	Willow Grove, (L1)	200
(N3)	300 Roddy, (M3).....	150	South Tunnel, (J2)	100	Una, (H2).....	100	Winchester, (J4)...	2,203
	150 Roellen, (C2)....	150	Sparta, (L3)....	1,517	Unicoi, (R2)....	250	Winfield, (N1)...	200
(O3)	200 Rogersville, (P2)...	1,402	Speedwell, (O2)...	400	Union City, (C2)...	4,412	Woodbury, (J3)...	278
	488 Rome, (J2)....	300	Spencer, (L3)...	210	Unionville, (H3)...	150	Woodland Mills, (C2).....	250
	200 Rossville, (B4)...	171	Spring City, (M3)	1,001	Vale, (E2).....	200	Woodlawn, (F1)...	170
2)	300 Rucker, (J3)....	100	Springcreek, (D3)...	200	Vanleer, (G2)....	180	Woodriddle, (N1)...	300
	250 Ruppertown, (F4)...	490	Springfield, (H2)...	3,860	Vaughtsville, (S2)...	100	Wynnborg, (C2)...	200
	200 Ruskin, (F2).....	499	Spring Hill, (H3)...	403	Victoria, (L4)....	150	Yorkville, (C2)...	300
			Springville, (E2)...	400			Yuma, (E3).....	200
			Stanton, (C4)....	500			Zach, (E2).....	150

Agricultural experiment stations are located at Knoxville, Columbia, and Jackson; the agricultural extension service of the university reaches more than 300,000 of the rural population each year, making available to those who cannot attend the colleges and universities the most up-to-date scientific information on all phases of farm and home life.

State Teachers' Colleges are maintained in each of the three political divisions of the state, namely, at Johnson City, Murfreesboro, and Memphis. There is also the Tennessee Polytechnic Institute at Cookeville, the Peay Memorial Normal School at Clarksville, and for negroes the Agricultural and Industrial Normal at Nashville.

In order to give boys and girls practical education in agriculture and home economics, vocational agricultural instruction was inaugurated in 1917, in cooperation with the public-school system, and the Tennessee Training and Agricultural School for Boys was established at Nashville. The state board for vocational education also provides for the promotion of trade and industrial education. Instruction is given on a full-time, part-time, or evening basis, and, in many cases, in the industrial plant or place of employment.

There are many private and denominational institutions for higher education, including the University of Chattanooga, at Chattanooga; Vanderbilt University, at Nashville; Carson and Newman College, at Jefferson City; Cumberland University, at Lebanon; the University of the South, at Sewanee; Southwestern University, at Memphis; Maryville College, at Maryville; Union University, at Jackson; Peabody College, at Nashville; Lincoln Memorial University, at Harrogate; Bethel College, at McKenzie; Milligan College, at Milligan; and Tusculum College, at Greeneville. Prominent schools for the colored are Fisk University (which see), the largest negro university in the United States; Roger Williams University, Meharry Medical College, and Walden University, at Nashville; Le Moyne Normal Institute, at Memphis; and Knoxville College, at Knoxville.

State Institutions. The charitable and penal institutions are controlled by the department of state institutions; the commissioner is appointed by the governor. There are hospitals for the insane near Nashville, Knoxville, and Bolivar; an institute for the blind at Nash-

ville; a school for the deaf and dumb at Knoxville; a Confederate soldiers' home near Nashville, on the grounds of "The Hermitage," formerly the home of Andrew Jackson; a reform school for boys in Davidson County; an industrial school and a penitentiary at Nashville; Brushy Mountain Prison at Petros, where the state owns coal mines, operated by

convict labor; a girls' vocational school at Tullahoma, and one for colored girls, near Nashville; and a new home and training school for the feeble-minded, also near Nashville. Since 1917 the leasing of convict labor to private contractors has been abolished.

The Land.

From its mountainous eastern border, Tennessee slopes gradually downward and westward to the bottom lands of the Mississippi River. Geographically, as well as politically, Tennessee falls into three divisions—East, Middle, and West Tennessee.

Along the eastern border lie the Great Smoky and Unaka mountains, a part of the Appalachian range. Many of the ridges in this picturesque region rise to more than 5,000 feet; Mount Le Conte, 6,680 feet, is one of the highest peaks east of the Rockies. In the Great Smoky region of Tennessee and North Carolina is the new Great Smoky Mountains National Park.

The great valley of East Tennessee, cutting obliquely across the eastern section of the state, can be seen from Mount Le Conte. The rich soils of this valley make it splendid farm land. The valley is flanked on the west by the Cumberland Plateau, which forms a rampart of rocky cliffs, 1,400 to 1,800 feet high. On this plateau is the famous Lookout Mountain, from which, it is said, seven states may be seen. The plateau slopes westward and drops abruptly to the Highland Rim.

Middle Tennessee includes the western part of the plateau, and the Central Basin, which the Highland Rim encloses. The northward



GEOLOGICAL FORMATION NEAR DAYTON, TENN.

sweep of the Tennessee River marks the western limit of this region. In the Basin are some of the most fertile crop lands found in the state. It is also a natural livestock area, and many famous race horses have been bred in this district.

From the Tennessee to the Mississippi lie the gently rolling plains and the "bottoms" of West Tennessee. Being more generally level, this section is under almost complete cultivation.

Rivers and Lakes. The Mississippi, Tennessee, and Cumberland rivers form the great drainage system of the state. The Tennessee, the longest tributary of the Ohio, crosses the state twice; with its tributaries, it drains most of the state, and furnishes many miles of navigable waterway. The Cumberland, another affluent of the Ohio, is most important commercially. Winding through a region of undeveloped coal fields, it promises to be one of the country's great highways for coal traffic. It flows through Nashville.

Sources of the State's Wealth

Agriculture. Tennessee is an agricultural state. About sixty-seven per cent of the area of the state is in farms; and over half of the population is engaged in agriculture. The central basin and western and northeastern parts of the state are the important agricultural sections. Because of the variation in climate and soils, it is possible to grow a great diversity of crops. The soils of West Tennessee are largely sandy silt loams, adapted to a wide variety of crops. The alluvial river bottoms are as fertile as any soils in the United States, and on such lands cotton, corn, and alfalfa grow exceptionally well. Dark tobacco is grown in the northern counties. Small fruits and berries grow well on the uplands, and apples grow well in the higher altitudes.

The Middle Tennessee Basin has some of the finest farms in the state. The bottom lands are exceptionally fertile and well watered, and blue grass grows abundantly. Combined with these conditions are a moderate temperature and a long grazing season, which make the Basin a natural livestock country. Many of the most famous American race horses and stables are claimed by this region. Breeding of horses and mules, once very important, has declined somewhat since the advent of the automobile and the tractor.

Tennessee is an important Southern cattle state, and ranks fourth in number of registered Jersey cows; pure-bred Jerseys are shipped from Tennessee throughout the Union. Among the Southeastern states, Tennessee is the leader in poultry production, and from Knoxville baby chicks are shipped by thousands, over the United States and to Cuba.

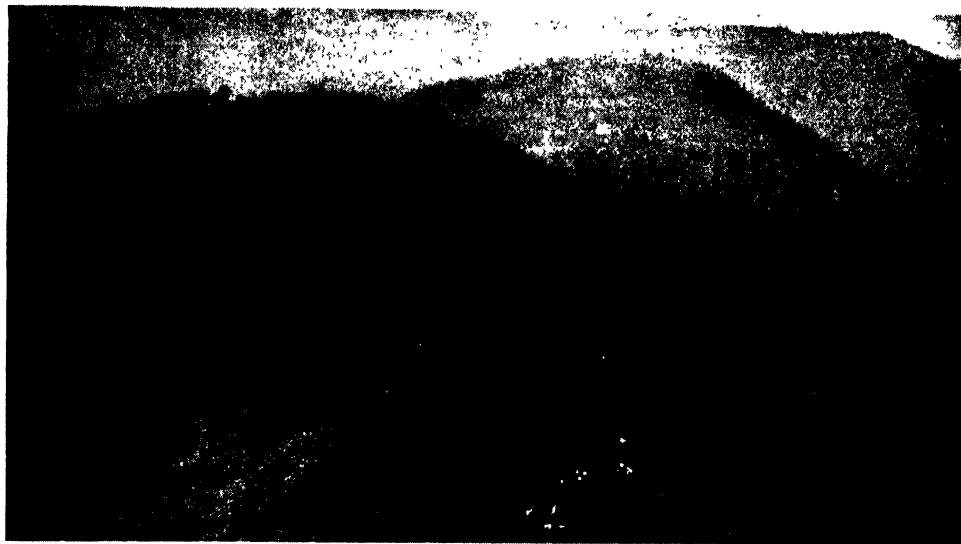
Reelfoot Lake, the only large lake in the state, eighteen miles long and very shallow, largely covers a drowned forest, which was submerged during earthquakes, in the winter of 1811-1812. Through the clear water, the dead branches of the trees may be plainly seen.

Climate. Except on the mountain heights and in the bottomlands, the climate of Tennessee is mild. However, great variation occurs, because of the diversity of elevation. On the banks of the Mississippi, the climate is like that of Upper Louisiana, while in the lofty mountains, the average temperature is equal to that of Montreal. The state is in the same latitude as Northern Africa and Southern Italy, but the lack of moderating sea winds makes the Tennessee summers hotter and the winters colder. The average annual temperature ranges from 61° in the Mississippi lowlands to 53° in the Unaka Mountains. The annual precipitation is forty to fifty inches, the rainfall being heaviest in late winter and early spring.

The chief crops of the state, in the order of their importance, are corn, cotton, hay and forage plants, and tobacco. Tennessee is one of the first states in the Union in the production and shipping of strawberries.

Forests. The state was originally covered with heavy forests, and it is estimated that about 19,000,000 acres are still woodland. One hundred fifty-two varieties of timber are grown, but white oak composes two-thirds of the entire stand. Memphis is in the center of the greatest hardwood district in the United States, and, with Nashville and Johnson City, produces many lumber products. It is claimed that nearly ninety-five per cent of the country's red cedar comes from Tennessee. There is no state appropriation for forest-fire protection, but a fire-warden system has been organized.

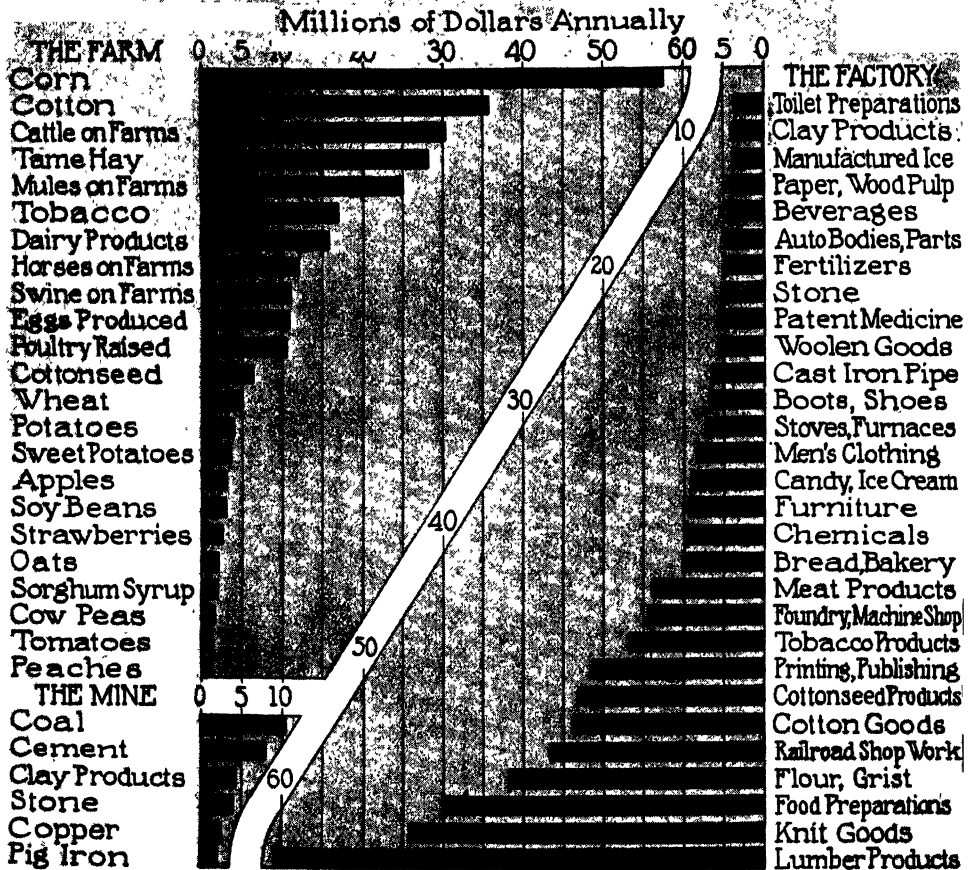
Minerals. Coal is the most important mineral product of the state. In the Cumberland table-land, the fields of bituminous and semi-bituminous coal cover about 4,400 square miles. Iron ores in workable quantities are found in forty-four counties of the state. The state also ranks high in copper production; practically the entire output comes from the Ducktown mines, in the southeast corner of the state. These mines are the only important copper mines in Eastern United States. Deposits of stratified phosphate rock are located southwest of Nashville, and Tennessee is surpassed only by Florida in its output. Marble of rare purity and beauty, sandstone, limestone, and slate are quarried. Knoxville is often called "the Marble City." There are small quantities of silver, gold, barites, manganese, potter's clay, zinc, and petroleum.



Photos: U & U

Scenery in Eastern Tennessee. Above, the ridges of Smoky Mountains. Below, wooded foothills that present vistas of wild beauty.

TENNESSEE PRODUCTS CHART



Figures are from Federal and state sources, and represent averages for three years.

Manufactures. The raw materials for Tennessee's manufacturing industries are largely supplied by the natural resources of the state. Textiles and lumber and timber products lead the list of manufactured goods. Food preparations, flour and feed, cottonseed oil, cake, and meal, tobacco, and snuff are other products of importance. Railroad car construction and repair go hand in hand with the many railways in the state, while printing and publishing follows in the wake of the cotton industry. Kingsport claims the honor of being the only city in the United States which sees raw logs transformed into finished, bound books. A complete list of Tennessee's manufactures would include, besides the articles mentioned above, such diverse things as bags, chemicals, knitted goods, marble, agricultural implements, stoves, artificial silk, and many more too numerous to mention.

Safety laws regulating factory conditions have been passed, and the labor of women in

industry has been restricted to fifty-seven hours a week. The employment of children under sixteen in workshops, factories, or mines is illegal.

The vast hydroelectric resources of the state are being developed to a greater extent every year, and Tennessee is linked with Alabama, Georgia, and the Carolinas in the great interconnecting power system of the Southeast.

Transportation. Tennessee has extensive facilities for water transportation in the Mississippi, Tennessee, and Cumberland rivers. The Mississippi affords communication with the entire Mississippi Valley and the Gulf ports. The Tennessee is navigable for small vessels from Knoxville to the Ohio River, and the Cumberland is open to traffic for 500 miles. The latter river is the chief highway for the transportation of coal. Memphis, Nashville, Chattanooga, and Knoxville are ports of entry.

There are over 4,000 miles of steam roads and over 400 miles of electric railway in the



STATE CAPITOL AT NASHVILLE

state. The most important lines are the Nashville, Chattanooga & Saint Louis, the Mobile & Ohio, the Louisville & Nashville, the Illinois Central, the Clinchfield, the Southern, the

Gulf, Mobile & Northern, and the Tennessee Central. In 1923 a department of highways and public works was created. There are nearly 4,000 miles of surfaced roads.

Government and History

Government. The third and present constitution of the state was adopted in 1870. Amendments may be proposed once in six years, and must be approved by a majority of the voters, and by two-thirds of the succeeding legislature. So far, all attempts to amend the important provisions of the present constitution have failed.

The *legislative* power is vested in an assembly consisting of a house of representatives of not more than ninety-nine members, and a senate of thirty-three members, or not more than one-third the number of representatives. No clergyman is eligible to election. The assembly meets biennially; the regular sessions are not limited, but payment is allowed for only seventy-five days; twenty days' pay is given for special sessions.

The executive department consists of the governor, elected for two years; the secretary of state, comptroller, and treasurer, elected by the legislature; the attorney-general, appointed

by the supreme court; and the superintendent of public instruction, commissioners of agriculture, statistics, and mines, assayer, entomologist, and officials of the penitentiary, appointed by the governor.

The *judicial department* consists of a supreme court and court of civil appeals, each having five judges elected for eight years, thirteen chancery courts, nineteen circuit courts, and county courts, each having one judge elected for eight years.

Mothers' pension laws and child-labor acts have been passed. A state budget commission was formed in 1917. In 1927 a reorganization bill consolidated sixty-four departments into eight.

Settlement and Early Government. Tennessee was first visited by De Soto; later, by Marquette and La Salle, in their explorations of the Mississippi Valley. The territory composing the present state was included with North Carolina in an English grant to Sir Wal-



Photo: U & U

AT THE TOP OF LOOKOUT MOUNTAIN

ter Raleigh. By 1690 the first traders from Virginia were visiting the Cherokee Indians, and by 1748 hunters began to follow the traders. In 1750 colonists from Virginia reached and named the Cumberland River and Mountains in honor of the royal duke. In 1756 or 1757, settlements were made by pioneers from North Carolina, but these were soon destroyed by the Indians.

In 1768 the Treaty of Fort Stanwix gave the English the region including Kentucky and a large part of Tennessee. After that, settlers felt freer to settle in this western territory. The first permanent settlements were made in 1769, 1771, and 1772, by the Watauga Association, a company of colonists from Virginia and North Carolina who settled along the Watauga River. They organized a free and independent commonwealth, said to be the first one in the country established by men of American birth. After the Declaration of Independence, the Wataugans asked North Carolina to annex them as the District of Washington. The hardy mountaineers served in the Continental armies, and did valiant service in defeating Ferguson at King's Mountain.

In 1784 North Carolina ceded the territory of Tennessee to the United States, giving the nation a year or more in which to accept or

decline. As this left the territory without state or Federal protection, the inhabitants revolted and formed the State of Frankland, or Franklin, with John Sevier as governor. Congress ignored the new state, and the jurisdiction of North Carolina was established in 1788, when Sevier's term of office expired. Two years later, Tennessee was ceded to Congress as the "Territory South of the Ohio." A steady stream of immigrants poured into it, and after a long struggle, Indian and Spanish hostilities were suppressed, the final struggle occurring in 1794.

Statehood. On June 1, 1796, Tennessee was admitted as the sixteenth state of the Union. It was the first state created out of government territory; Kentucky and Vermont, which were previously admitted, were formed from territory belonging to individual states. The Tennessee troops under Andrew Jackson played a distinguished part in the War of 1812, in the Creek and Seminole wars, and in the war with Mexico, in 1847.

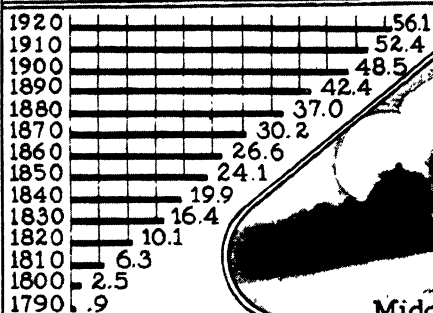
The western, middle, and eastern sections of the state remained divided in sentiment and almost distinct commonwealths until after the War of Secession, and still form three political units in the state. The eastern section was strongly Union in sentiment, and published the first Abolition paper in the United States.

TENNESSEE

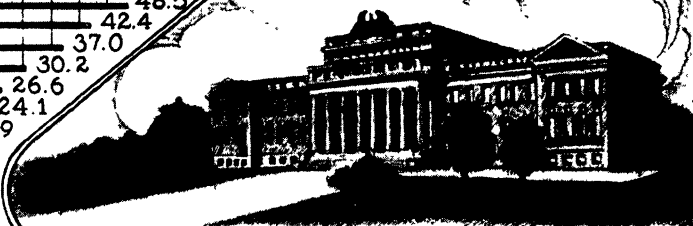
Lookout Mountain



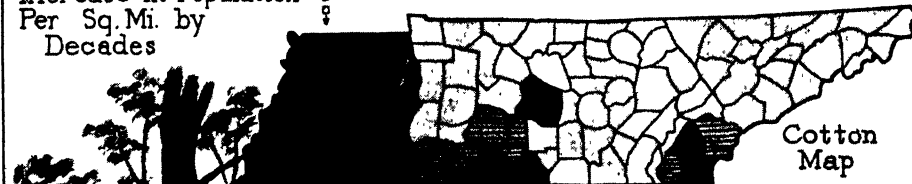
Congressional Districts



Increase in Population
Per Sq. Mi. by
Decades



Middle Tennessee Normal School,
Murfreesboro



Cotton
Map

- Counties Having
- Over 50,000 Acres
 - 25,000 to 50,000 Acres
 - 10,000 to 25,000 Acres
 - 1,000 to 10,000 Acres
 - 250 to 1,000 Acres



The Hermitage,
Andrew Jackson's
Home, near Nashville

QUESTIONS ON TENNESSEE

(An Outline suitable for Tennessee will be found with the article "State.")

What organization which played a large part in history in the period after the War of Secession originated in this state?

Where is Tennessee's "drowned forest," and how was it submerged?

Is the highest point of land in the state loftier or less lofty than the highest point of each state upon which Tennessee borders?

What laws relating to industrial conditions has the state passed, which show its progressive character?

How were the eastern and western sections of the state divided in their sentiments on the slavery question, in the years before the War of Secession?

What Presidents are buried in the state?

How many of these were born within the boundaries of the state?

When did Tennessee become a state?

How many states besides the original thirteen were in the Union when it was admitted?

For what is a part of the famous estate of a President of the United States in this state now used?

For what is Fisk University noted?

How large a proportion of the area is still wooded? What type of wood is predominant?

What are the chances that the pencil you use is made of red cedar from Tennessee?

By what name was the territory comprising Tennessee known when it first came into the possession of the United States?

From what four sources is the revenue for the upkeep of the schools derived?

What class of the inhabitants, formerly neglected educationally, are now receiving the benefits of education?

If a man in the former days in Tennessee wanted an article valued at six shillings, but had no money, how might he pay for it?

Why are the winters colder and the summers hotter in Tennessee than in Southern Italy, which is in the same latitude?

To what state did this territory originally belong?

From what regions did the first settlers come?

How many states border upon Tennessee?

How many other states have an equal number of boundary states?

How many states are larger? How many of these larger states have a greater population than Tennessee? (See list in article UNITED STATES.)

What makes the Cumberland River so important commercially?

What is the railway mileage of the state to each hundred square miles of area?

How does it compare in this respect with each of the states upon which it borders?

What recent development in the textile industry has brought added prosperity to certain towns in Tennessee?

Why is a tremendous amount of hydroelectric power available to Tennessee?

In what kind of livestock does Tennessee excel?

What phase of the livestock industry has declined, and why?

On the question of secession, the Confederate element finally prevailed, and Tennessee seceded June 8, 1861; it was the last of the states to withdraw from the Union. Next to Virginia, Tennessee was the chief battle ground of the war. There were 454 battles fought in the state, notable among them being the capture of Forts

Henry and Donelson, and the battles of Shiloh, Murfreesboro, Chattanooga, Lookout Mountain, Missionary Ridge, Franklin, and Nashville. Tennessee, readmitted to the Union, July 24, 1866, was the first of the Confederate states to return to the Federal government. The state escaped the corrupt "carpetbag"

government of Northern politicians, but the Ku-Klux Klan originated within its borders.

Tennessee boasts many distinguished men, including three Presidents of the United States—Jackson, Polk, and Johnson; many

Thomas Hughes as a Utopia for the sons of nobility. J.A.T.

Related Subjects. The reader who is interested in Tennessee will find much that is helpful in these volumes, in the following articles:

CITIES

The cities listed below are described under their own titles. For others, see back of state map.

Chattanooga	Memphis
Knoxville	Nashville

HISTORY

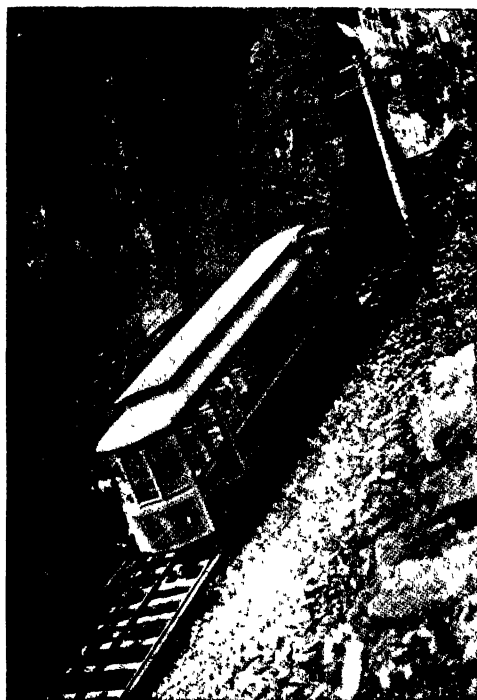
Frankland	War of Secession
Ku-Klux Klan	(Principal Battles)

LEADING PRODUCTS

Coal	Iron
Corn	Phosphates
Cotton	Tobacco

PHYSICAL FEATURES

Cumberland Mountains	Mississippi River
Cumberland River	Tennessee River



RAILWAY ON LOOKOUT MOUNTAIN

It is 530 feet less than a mile in length, the route carries passengers upward 1,700 feet, and the car makes the trip to the top in about seven minutes.

Cabinet officers and Justices of the Supreme Court; such fighting heroes as Farragut, Davy Crockett, Houston, Nathan B. Forrest, and Alvin C. York, hero of the Argonne in the World War; and Mary Noailles Murfree, the novelist.

Other Items of Interest. In the early days, coin was so scarce that no fewer than twenty articles were declared legal tender and given a definite value. Thus bacon was valued at sixpence a pound; a fox skin at one shilling sixpence; and a beaver skin at six shillings. The first anti-slavery society was organized in Tennessee.

At Nashville is the only exact replica in the world of the Greek Parthenon, built for the Tennessee Centennial Exposition. Indian Cave, in Granger County, one mile long, is in many respects a replica of Mammoth Cave. It is well lighted with electricity. Copper Hill claims the largest sulphuric-acid plant in the world. Rugby, an English settlement on the Cumberland Plateau, was founded by

TENNESSEE RIVER, the largest tributary of the Ohio, formed by the meeting of the Holston and the French Broad rivers, about four miles above Knoxville, Tenn. The main stream flows southwestward through Tennessee, enters Alabama at its northeast corner, dips in a great curve, and flows out again at its northwest corner, reëntering Tennessee. It then flows northward through that state and northwest across Kentucky, joining the Ohio at Paducah. Including the Holston and the North Fork of the Holston, it is 900 miles long. The Tennessee alone is 652 miles long, and since the completion of a canal (1889) around the shoals between Florence and Decatur, Ala., it has been navigable throughout its entire course. In Northern Alabama, rapids in the Tennessee have been utilized to supply power for a large hydroelectric plant. See **MUSCLE SHOALS; KENTUCKY (Its Rivers); TENNESSEE (Rivers and Lakes)**.

TENNIEL, *ten' yel*, SIR JOHN (1820-1914), an English cartoonist and book illustrator, famed for political cartoons made for *Punch*, and for his inimitable illustrations that add so much to the charm of Carroll's *Alice in Wonderland* and *Through the Looking-Glass*. He was born in London, and was practically a self-trained artist. When he became cartoonist for *Punch*, in 1850, he had already won distinction as the painter of a fresco, *Saint Cecilia*, for the House of Lords. His position on the staff of *Punch* was retained for half a century. Tenniel's work was admired for its originality and dignity, no less than for excellence of technique.

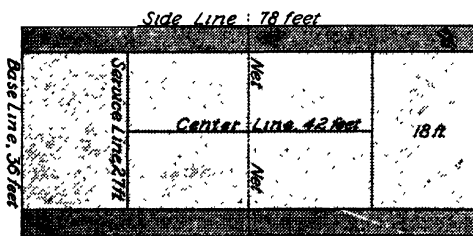
Other Works. Besides the *Alice* books, he illustrated *Aesop's Fables*, Moore's *Lalla Rookh*, *The Ingoldsby Legends*, and various other works.

TENNIS, one of the earliest of ball games, whose origin is unknown. The old game was the basis for the modern game, which in its early modifications was known as *lawn tennis*,



POSITIONS ASSUMED IN SERVING AND RETURNING

and which is now generally called simply *tennis*. The old game of tennis was the popular sport of kings, and is sometimes referred to



PLAYING FIELD

as the "royal game." There are still a few of the old tennis courts in existence, but the game has practically given way to the more modern form. It is played on a hard court of grass, gravel, cinders, clay, or asphalt, with balls and rackets. The balls, $2\frac{1}{2}$ inches in diameter, are of rubber, covered with felt. They are usually white, although colored balls have recently been introduced. The rackets, which are 8×15 inches, have frames of ash or hickory, with cedar handles, the frames being netted with tightly strung, varnished gut. Steel

frames are also used. The court is 78×27 feet, marked out by white tapes or lime boundaries, with an alley $4\frac{1}{2}$ feet beyond on either side, used only when four people play. A net, three feet high, divides the court into halves. Each side is divided again 21 feet from the net, and the space between this line and the net is bisected into rectangles, called *receiving courts*.

The object of the player who starts the game is to knock the ball with the racket into the opponent's court so that he cannot return it. This player, called the *server*, stands behind the right side of the base line. He serves the



RACKET AND BALL

ball with an overhead stroke, so that it flies into the receiving court diagonally opposite him. Two balls are allowed for the serve.

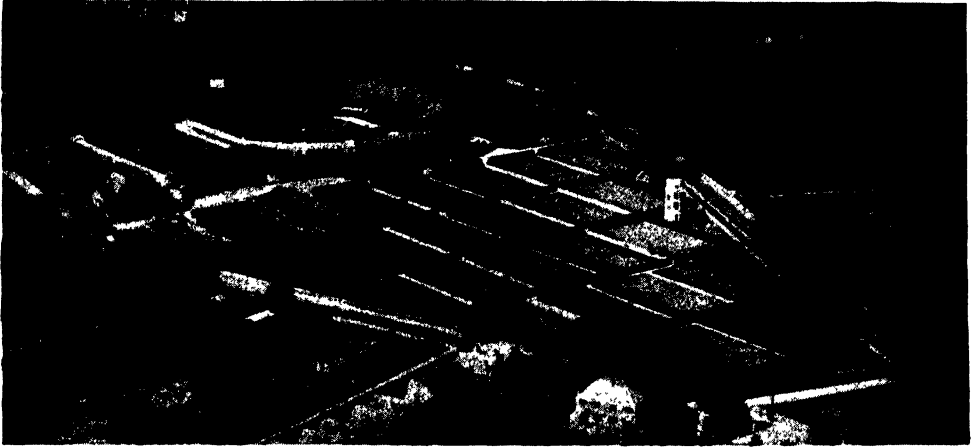


Photo: U & U

TENNIS COURTS AT WIMBLEDON, ENGLAND

The scene of the most important tournaments in the world of tennis. The games here every year exceed in interest those held in the south of France.

If both are *faults*, that is, if both fail to land in the receiving court, the server loses and the receiver gains a point. The first ball must be bounced, but other balls may be returned, either on the first bounce or before touching the ground. When one side or the other misses a ball, service begins again from the opposite side of the line, and so on, alternately. At the end of the game, the receiver becomes the server, and *vice versa*.

Each ball missed scores the opponent a point. The first point is 15, the second 30, the third 40, and the fourth 50, or *game*. If each player has three points (40), the score is called *deuce*, and two successive points must be made to win the game. The first point after deuce is called *advantage* (*ad* or *vantage*, for brevity); if each has four points, the score returns to deuce. When one side wins all the points before the opposite side has scored any, the round is called a *love* game.

Six games make a *set*, unless each player has won five games, when two games in succession must be won to complete the set. Three out of five sets must be won to decide a championship.

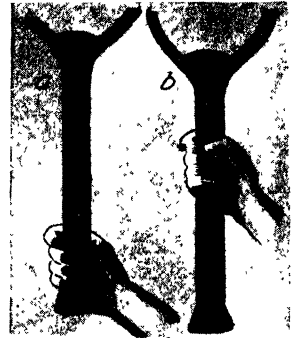
The modern game of tennis was introduced into the United States by Dr. James Dwight in 1875, and it at once became popular. In 1881 the United States Tennis Association was formed, and a tournament was held in New York, with thirty-three clubs participating. The first national championship match was held the same year at Newport, R. I.

Since 1900, international matches have added interest to the game. In that year, a cup was offered by Dwight F. Davis as a trophy for international competition. The United States won the cup in 1900, 1902, 1913, 1920-1926;

Great Britain, 1903-1906, 1912; Australia, 1907-1909, 1911, 1914, 1919; and France, 1927, 1928, 1929. The competition for the Davis cup is by teams, not individuals. The

Wightman cup, established by Mrs. George W. Wightman, in 1923, is a perpetual trophy offered for competition of women in England and America. Matches, consisting of five singles and two doubles, are played annually, one year at Wimbledon, England, and the next at Forest Hills, Long Island. The United States won the cup in 1923, 1926, 1927, and 1929. See WILLS, HELEN.

TENNYSOON, ALFRED (1809-1892), one of the great English poets of the Victorian Age, was born August 6, 1809. His father, the rector of Somersby, was a man of learning and of refined taste, and in the home a vivid imagination and a love for beauty were developed in Alfred and his brothers and sisters, by familiarity with fairy legends and other fanciful tales. In 1815 Alfred was sent to the Louth Grammar School, where he remained five years. His father cared for his education from that time on until 1828, when the youth entered Cambridge University. In these years,



HOLDING THE RACKET

- (a) Correct position of hand
- (b) incorrect position.

spent in his quiet, pleasant home, he had plenty of time for reading and reflection, for the close observation of nature, and for practice in poetic composition, and the first results of the period were seen in the little volume published in 1827, by Charles and Alfred Tennyson, entitled *Poems by Two Brothers*. The book attracted no attention, and brought to its authors only about \$100.

Poetry of Student Days. The constantly secluded life at home had made the brothers rather shy, and when they entered the uni-

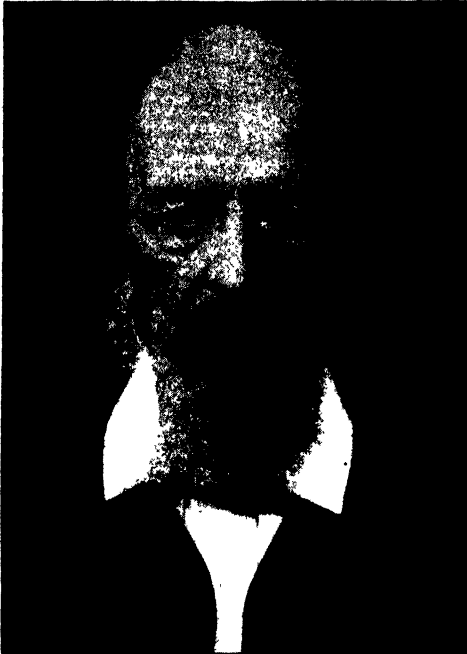


Photo: Brown Bros.

ALFRED TENNYSON

One of the noblest and most representative figures in nineteenth-century literature.

versity, they did not find it easy to make friends. Gradually, however, some of the brightest young men of the school became acquainted with the brothers and made them members of the select society known as "The Apostles." In 1829 Alfred distinguished himself by winning the Chancellor's prize for his blank-verse poem *Timbuctoo*, and in the following year he published his *Poems, Chiefly Lyrical*. Critics found faults in this volume, but recognized, too, the promise of the young author; indeed, the melody of such poems as *Mariana* and *Oriana* could not fail to make itself felt.

Shortly before his father's death, in 1831, Tennyson left Cambridge without receiving a degree. Two years later, he published another book of *Poems*, among which appeared some of the most exquisite of his lyrics, in-

cluding *The Lady of Shalott*, *The Palace of Art*, *The Lotos-Eaters*, *The Dream of Fair Women*, and *Oenone*. Again the critics did not spare his work, and a particularly savage article appeared in the *Quarterly Review*; but had Tennyson written nothing after that time, he would by that volume have proved his right to rank with the great English poets.

His Greatest Years. In 1833 an event occurred which affected the poet so profoundly that he remained in seclusion for ten years. This was the sudden death of his best friend, Arthur Henry Hallam, son of the historian. At the end of the long period of silence appeared a new collection of *Poems*, containing, with others of special note, *Locksley Hall*, *Morte d'Arthur*, *Dora*, *Ulysses*, and *Break, Break, Break*. In 1847 was produced *The Princess*, a long narrative poem which is perhaps most noteworthy for the exquisitely finished songs interspersed through it—*Sweet and Low*; *The Splendor Falls on Castle Walls*; *Tears, Idle Tears*; and *As Through the Land*. This third collection is marked by a depth of thought not found in his earlier writings, but the spiritual development which came as a direct result of Hallam's death found its fullest expression in the long elegy *In Memoriam*, composed of lyrics written at various times, but published as one poem in 1850. This masterpiece is equaled in its class only by Milton's *Lycidas* and Shelley's *Adonais*. Much longer than either, it presents all phases of the poet's grief, and takes up the most serious questions as to life, death, and immortality.

Appointment as Poet Laureate. In the same year, Tennyson was made poet laureate. He was then enabled to purchase the estate of Farringford, on the Isle of Wight. Five months before he received this honor, he had married Miss Emily Sellwood, to whom he had been long betrothed. Years later, the poet said of her, "The peace of God came into my life before the altar when I wedded her." In 1867 Tennyson built Aldworth, his house near Haslemere, and thereafter passed his time between the new home and Farringford. Eight years before his death, he was made Baron of Aldworth and Farringford.

After his appointment to the laureateship, he produced *Maud*, a dramatic representation of a morbid man; *The Idylls of the King*, an idealistic treatment of the King Arthur legends, and perhaps his most popular work; *Enoch Arden*, portraying one of the noblest heroes in literature; the dramas *Queen Mary* and *Becket*; *Locksley Hall Sixty Years After*; *Demeter*; and several other volumes of poems and dramas. The Arthurian legends always had a fascination for him, and before his use of them in the *Idylls*, he had touched on them in such poems as *The Lady of Shalott* and *Sir Galahad*. The *Death of Oenone* appeared after he died.



ALDWORTH, TENNYSON'S HOME

Estimate of His Work. Melody is perhaps the most notable characteristic of Tennyson's verse. At the outset, it was sometimes secured at the expense of thought—the little lyric *Where Claribel Low Lieth*, for instance, is almost pure music without an idea. Later, however, he sought to unite thought and melody, and his ability to make sound fit sense is shown clearly in such contrasting lines as the following, from the *Passing of Arthur*. Those of the first group are rugged and harsh, and appropriate to the scene they describe; those of the second are smooth, flowing, beautiful:

The bare, black cliff clang'd round him, as he based
His feet on juts of slippery crag, that rang,
Sharp-smitten with the dint of armed heels.

And on a sudden, lo! the level lake,
And the long glories of the winter moon.

The music of his verse was but an expression of the love for harmony which was one of his strongest characteristics; and he was keenly sensitive to the suffering which he saw in the world—the discords in life's harmony. It was to science that he looked for the righting of the world's wrongs, and thus he has been called the poet of science. Evolution has a large place in his writings. Tennyson was buried in Westminster Abbey.

TENOCHTITLAN, *tay nohch teet lahn'*. See AZTEC; MEXICO (Early History); MEXICO CITY.

TENPINS. See BOWLING.

TENSE, a word derived from the Latin *tempus*, meaning *time*, and used in grammar to denote the forms which a verb may take to tell the time when an action occurs. Tense is indicated by changes in the forms of verbs and by auxiliary words, as shown below.

Tense Forms of the Indicative. There are three simple tense divisions in the indicative mode—present, past, and future—which indicate the time *now*, *past* time, and time *to come*. However, in each case the act may be viewed as completed at some definite time in the present, past, or future. Hence there are also three *perfect* tenses, denoting *perfected* action or state. The following table gives these six tenses:

Present	I am, do, see, walk
Past	I was, did, saw, walked
Future	I shall be, do, see, walk
Present Perfect	I have been, done, seen, walked
Past Perfect	I had been, done, seen, walked
Future Perfect	I shall have been, done, seen, walked

Action in the present, past, and future may also be represented as continuing, or in progress, and is then expressed thus:

I am doing, seeing, walking
I was doing, seeing, walking
I shall be doing, seeing, walking

The perfect tenses likewise have a form which shows that the action is continuous—

I have been doing, seeing, walking
I had been doing, seeing, walking
I shall have been doing, seeing, walking

Transitive verbs, like *to see*, may be conjugated in all tenses, in both the active and the passive voices. The passive forms are *I am seen*, *I was seen*, *I shall be seen*, *I am being seen*, etc. [For a discussion of voice, see VOICE; VERB (Properties of Verbs).]

Past and Present Perfect. These two tense forms are sometimes confused. The distinction between them is this: Whereas the past tense expresses action merely as belonging to past time, the present perfect expresses action as belonging to past time, but also as touching the present. It is correct to say, *The Japanese have made rapid progress within the last decade*; also, *The Japanese made rapid progress during the last half of the nineteenth century*. In the first case, the action is viewed as coming up to the present; in the second case, simply as taking place in past time. It is incorrect, on the other hand, to make such statements as, *I have left school five years ago*, or *I wrote a letter in the past half hour*. The correct forms are, *I left school five years ago*; and, *I have written a letter in the past half hour*.

Past and Past Perfect. Compare the following: *Washington was first inaugurated in 1789*; *Washington had already been inaugurated when the first national census was taken*. In the first sentence, there is a simple statement of action in past time, and in the second a statement of an act completed before some other specified act.

The Future Tenses. The simple future tense denotes an action that will take place at one time in the future, while the future perfect views an action as one that will be completed before the occurrence of some other future act. The distinction may be seen in the following: *I shall leave to-morrow at ten o'clock*; *I shall have left to-morrow before they arrive*.

Modern usage is tending to eliminate the use of the future perfect, where the simple future may be substituted without loss of meaning. Thus, instead of *I shall have left to-morrow before they arrive*, one could use, *I shall leave to-morrow before they arrive*, to express the same thought.

Shall and Will. Most grammarians make the following distinction between *shall* and *will*, two auxiliary verbs used in forming the future tenses of the indicative: When used with the first person, both singular and plural, *shall* denotes simple futurity; when used with the second and third persons, it denotes command or necessity. *Will* in the first person, singular and plural, denotes purpose or intention; and in the second and third persons, simple future action. These meanings are compared in the following:

SIMPLE FUTURITY	COMMAND, NECESSITY, OR INTENTION
I shall see you again	
You will know by to-morrow	I will not apologize
He will arrive to-day	You shall obey
	He shall make amends

The distinctions between these auxiliary verbs are not adhered to so strictly as they once were, and *will* is used in place of *shall* in much written and spoken English. However, the main distinctions are observed by careful writers and those who speak good English.

Other Modes. For tenses of the subjunctive and imperative modes, see **MODE**.

The Infinitive. The infinitive has but two tenses—the present and perfect. The forms for both voices are as follows:

Present—to love, to be-loved

Perfect—to have loved, to have been loved

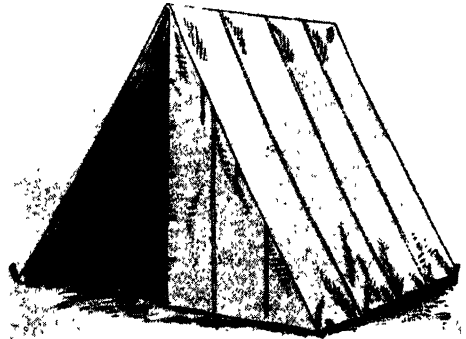
It must be admitted that in many cases the grammatical tense names do not actually indicate the time expressed by verb forms. For example, besides the simple present meaning of the present tense, that form may indicate present, past, or future in actual time. In historical narrative, the present tense is frequently used, especially to describe a scene, although all of the action may have occurred in past time. It may express a universal truth, such as *The earth revolves around the sun*; or it may express habitual action, such as *He goes to the bank every day*. It may express future time, as in *She is going next week*. Because of this fact, some attempts have been made toward a revision of the grammatical forms to fit current usage, but formal grammar still employs the established tense forms.

TENSILE STRENGTH. See **TENACITY**.

TENSILE STRESS. See **STRENGTH OF MATERIALS**.

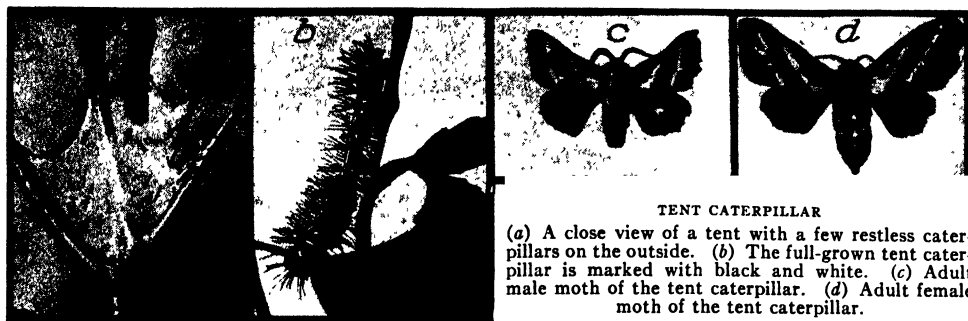
TENSKWATAWA, *tenz kwa' tah wah*, called "the Prophet," brother of the Indian chief Tecumseh (which see).

TENT, a portable dwelling place, usually made of canvas. It is thought that tents are of Eastern origin, having been introduced into Spain by Mohammedan invaders, and from



AN "A" TENT

there spreading over Europe and later to America. The native Indians of North America made wigwams, tepees, or tents of bark and the skins of animals, probably long before white men set foot on the American continent. In many parts of Canada and the Northern United States, the Indians still make these somewhat primitive dwellings, but, for the most part, they have either learned to build



TENT CATERPILLAR

(a) A close view of a tent with a few restless caterpillars on the outside. (b) The full-grown tent caterpillar is marked with black and white. (c) Adult male moth of the tent caterpillar. (d) Adult female moth of the tent caterpillar.

houses or have adopted the modern canvas tent of the white man.

Various Forms. The simplest form of canvas tent follows the pattern of the Indian tepee; it is circular at the bottom, and rises to a point in the center. The modern name for this tent is the *bell*, as it is bell-like in shape. This tent is used by nearly all armies and campers throughout the world. It is set up with a pole in the center, over which the tent is spread, pegs being driven into the ground at proper distances, to which to attach ropes to keep the tent in position. The "A" tent (in the illustration) is equally simple in construction, and may be stretched over a ridgepole running from two upright poles and pegged down to the ground. The *wall tent* is the "A" tent with perpendicular walls to the height of two or three feet, with the gable above, and is similarly erected and held in position. The wall tent has the advantage of giving more headroom than either the "A" or the "bell" tent.

A *marquee* is a large form of tent, chiefly devoted to show and social usages, and to field hospitals with an army. The tents used by armies in peace times are quite different from those carried in war. In fact, the carrying of tents has in most armies been abandoned, except for what are called light "shelter tents," carried by each man. Modern war conditions do not allow of excess of weight in transport, and were full tent accommodations to be carried, it would necessitate the employment of at least double the usual number of vehicles and animals for transport. Tents, in active service, have therefore given place to various temporary shelters. In the World War, dugouts many feet below the surface of the earth sheltered many of the fighters of all armies.

Among the Nomads. In the pastoral districts of Asia, the main population has always lived in tents, and the rank and riches of the members of the various tribes are indicated by marks and symbols on their tents. The tents of Kedar, really Arabian tents of black goats' hair, gave rise to the Eastern expression "black as the tents of Kedar." Even in modern times, the nomadic Arab tribes carry with them their tents, and their homes are just where fancy or

advantage may lead them to "pitch their tents." The tents of the East, however, are more elaborate than the military and camping-out tents of the West, being often divided into apartments, the partitions being of rugs and skins that, according to Western values, are almost priceless.

Suggestions to Campers. For campers, the procuring of a suitable tent is a simple matter. The choice is wide, and tent materials have been greatly improved within recent years. For ordinary purposes, the "bell" or "A" tent will be found most suitable. It is in the choice of locality and in the actual erection of the tent that experience is necessary. One of the simplest precautions is often neglected by camping parties. That precaution is to avoid touching the sides or top of the tent during storms. The drip of water through the canvas will not occur if the material is not touched from the inside, and if the roof is kept free from leaves.

The digging of a trench around the tent is often regarded as unnecessary, yet neglect of this precaution may lead to flood conditions. The trench, to draw water off, built with due regard to the slope of the ground on which the tent is pitched, should be regarded as essential. Disasters would be less frequent if campers would apply good judgment, and a few minutes' work daily, to securing comfortable and hygienic surroundings.

Related Subject. In this connection, there will be found valuable material in the article *CAMP*.

TENTACLES. See COELENTERATA; HYDRA.

TENT CATERPILLAR, the name applied to the larvae of certain species of moths, with reference to the tent-shaped white webs that the caterpillars spin as nests for themselves. They are voracious eaters of foliage, and do much damage to forest and orchard trees. A destructive species attacking fruit trees is the *apple-tree tent caterpillar*, common in the states east of the Rocky Mountains. Another species of the Eastern states is the *forest tent caterpillar*. Two others are common on the Pacific coast, one found upon oak trees in spring, and the other upon fruit trees in late summer.

The moths of the apple-tree species are a dull reddish-brown, with two oblique, pale stripes on the forewings. In July the female moths lay their eggs in clusters or belts, on the branches of the apple and the wild cherry. In the early spring, the caterpillars eat their way out, and spin their tentlike canopies in the crotch of a branch. The full-grown caterpillar has a blackish skin, with white stripes along the back, and blue and yellow spots. It is covered with yellow hairs.

So ravenous are their appetites, that the occupants of a single tent may eat 12,000 young leaves. The caterpillars file out to feed in the middle of the morning and again in the afternoon; hence, effectively to exterminate them, the webs should be destroyed in the early morning or evening, when the occupants are at home. The nests may be cut off and burned, or destroyed on the trees with a torch. Lead arsenate is an effective spray against the caterpillars. In June the caterpillars scatter in all directions, to spin their cocoons in some protected cranny in fences and buildings. Within these silvery sacs they change to pupae, and in two or three weeks emerge as moths, to repeat the life history of the species.

The moths of the forest tent caterpillar, or forest army worm, are lighter in color than the ones described above, and have dark lines on their forewings, and a row of light dots down the middle of the back. Their tents are less conspicuous, and their egg belts are more nearly circular.

W.J.S.

Scientific Names. Tent caterpillars are the larvae of moths belonging to the family *Lasiocampidae*. The apple-tree species is known as *Clisiocampa americana*.

TEN THOUSAND, RETREAT OF THE. See **XENOPHON**.

TENURE OF OFFICE ACT, the name given to two acts of the United States Congress, which limited the President's power of removal of officers whom he had appointed. The first of these acts was passed in 1820; it limited the term of a large number of appointive officers to four years, and is therefore said to have laid the foundation for the introduction of the "spoils system" [see **CIVIL SERVICE** (Civil Service Reform)].

More generally known is the act of 1867, which Congress passed over the veto of President Andrew Johnson. From the foundation of the government, it had been the custom to allow the President to dismiss, at his pleasure, any officers appointed by him. As he was responsible for the acts of his subordinates, no authority had interfered in behalf of dismissed officials. Shortly after Johnson's inauguration, however, Congress began to indicate its disapproval of the President's policy, and there was soon open discord between them on questions of reconstruction.

Lest Johnson should exercise his powers of removal and perhaps thwart the Congressional plan of reconstruction, Congress passed the Tenure of Office Act, which required the Senate's consent to the dismissal of any official whose appointment originally had required its consent.

The law was a startling innovation in American government. Johnson ignored it in 1868, when he removed Edwin M. Stanton from the office of Secretary of War; this was one of the causes of the President's impeachment. The law was understood to be an emergency measure; during Grant's administration, it was modified, and in 1887 it was repealed. See **JOHNSON, ANDREW** (Administration).

TÉODORO, RIO. See **BRAZIL** (Rivers and Transportation).

TEOSINTE, *te o sin' te*. See **CORN** (Name and History).

TEPEE. See **INDIANS, AMERICAN** (The Early Indians in the United States and Canada: Architecture).

TERBIUM. See **CHEMISTRY** (The Elements).

TERCEIRA, *lehr sa' rah*, **ISLAND.** See **AZORES**.

TEREK, *tya' rek*, **RIVER**, a stream flowing into the Caspian Sea (which see).

TERENCE (**PUBLIUS TERENTIUS AFER**) (about 190—about 150 B.C.), a Latin playwright, born at Carthage. The date and the place of his birth have been the subject of much dispute, but he is said to have been carried to Rome as a slave, and educated there by a Roman Senator. His first play was *Andria*, an immediate success, which gained for him admission into the best Roman society. He went to Greece to study the comedies of Menander and Apollodorus, which he freely translated and adapted. After bringing out these plays, he sailed for home, but never returned from the voyage; accounts vary greatly as to the manner of his death.

During his brief life, Terence succeeded in winning an enduring reputation, though he was in no way an original writer. His ideal was artistic perfection, and the chief merit of his work is the perfect picture he has given of Greek life in the third century B.C., for his writings reflect nothing of the spirit of his own age and country. Plautus excels him in comic power, but not in tenderness, wit, and character drawing. Advanced Latin students in college courses read at least one of Terence's works.

His Writings. His six extant comedies, possibly representing all he ever wrote, are *Andria*, *Hecyra*, *Heauton Timorumenos*, *Eunuchus*, *Phormio*, and *Adelphoe*.

TERESA, *te re' sah*, a variant of Theresa. See **THERESA, SAINT**.



Photo at right: Visual Education Service

FORMS OF TERMITES' NESTS

The one shown at the right was found near the Congo River, in Africa; it looks like the trunk of a dead tree.

TERHUNE, *tur hune'*, MARY VIRGINIA (1830-1922), an American novelist and writer on domestic science, better known as MARION HARLAND. She was born in Amelia County, Va., received a careful education at private schools and from tutors, and began very early to write for publication. In 1856 she was married to the Reverend Edward Payson Terhune. Her first novel, *Alone*, appeared when she was twenty-three. This proved very successful, and her popularity grew with the appearance of her later sketches and stories, including *Husks*, *Sunnybank*, *At Last*, *Judith*, *A Gallant Fight*, *When Grandmamma Was New*, *The Distractions of Martha*, *Where Ghosts Walk*, *Marion Harland's Autobiography*, *Everyday Etiquette*, *A Long Lane*, and *The Carringtons of High Hill*. *Dr. Dale*, a novel, was written in collaboration with her son, Albert Payson Terhune, author and traveler. She also wrote *Common Sense in the Household* and many articles for magazines and newspapers, largely on cookery and domestic economy.

Her fiction has no great literary merit, but is interesting and of high moral tone. It is for her syndicated series of domestic-science articles, extending over a period of many years, that she will be longest remembered. Mrs. Terhune, at various times, was on the editorial staffs of *Babyhood*, *The Home-Maker*, *Wide-Awake*, and *Saint Nicholas*.

TERMINAL MORaine. See GLACIAL EPOCH; MORaine.

TERMITES, *tur' mites*, the common name of an order of insects popularly known as *white ants*, for they live in communities and

have somewhat the appearance of ants. Ants and termites, however, differ from each other structurally in important details. Termites constitute the order *Isoptera* (equal-winged insects). Ants belong to the order *Hymenoptera* (membrane-winged). See INSECT.

Termites are found most abundantly in warm regions, notably in Africa, Australia, and the Amazon regions. Some species build huge mounds, made of bits of soil mixed with saliva. These nests are sometimes fifteen feet in height. The dome-shaped interior is divided into numerous chambers and galleries, and in the center is a closed-in cell, where the king and queen are kept as prisoners. This royal pair constitute the perfect male and female of each colony. When they first hatch from the eggs, they have long, membranous wings, but after one flight into the air, during which the mating takes place, the wings break off at the base, and thereafter the pair are held as captives. In the cell, the female undergoes an extraordinary transformation, for her body swells until it is large enough to hold many thousand eggs. As one zoölogist has expressed it, she becomes a "loathsome cylindrical package, two or three inches long, in shape like a sausage, and as white as a bolster."

The eggs, deposited at the rate of several thousand a day, are borne away by the blind, wingless workers, which carry them to specially constructed cells and care for the larvae (young) as they are hatched. The workers make clay tunnels along the trunks and branches of trees, bringing back, through them, gums and decaying wood to feed the entire colony, and to them also falls the task of building and enlarging the

nest. Another wingless class, the soldiers, have large heads and mandibles. They are supposed to defend the mound from attack. Soldiers, workers, and king and queen develop from the same eggs, but scientists believe that



TERMITES

(a) Soldier; (b) worker; (c) adult male; (d) queen.

the differences in structure result from the kind of food given the larvae. Termites feed on wood, paper, and other forms of cellulose, and are very destructive in their efforts to find their food, for they tunnel their way through the woodwork of houses, destroy books and furniture, and do great damage to sugar cane and orange trees. In tropical forests, where these insects are found in large numbers, railroad-builders are forced to import cast-iron or steel at great expense, since they cannot use wooden ties. About 1,200 species are known, of which Europe has but two.

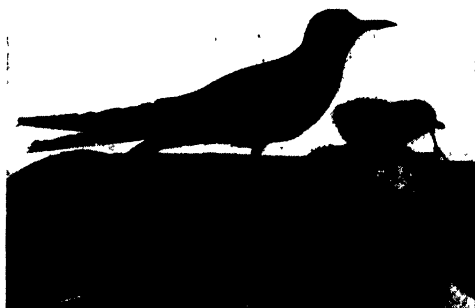
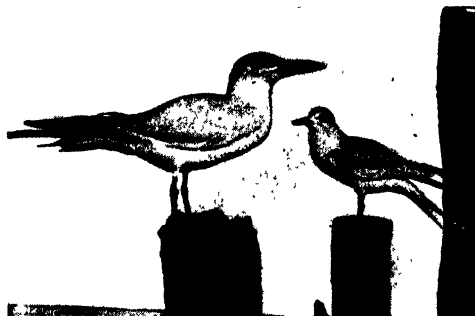
A few species of termites are known in the United States, and though they do not build large mound nests, they do considerable damage by tunneling through fence posts, trees, timbers of wooden buildings, bridges, trestles, and other structures. In houses they attack cloth, books, and paper. The United States Department of Agriculture recommends the use of stone, brick, or concrete for foundations of bridges and trestles, and for support posts of buildings. Where timber has to be used, it should be treated with creosote or other preservative. It is possible to keep termites out of houses by pouring kerosene on the ground where they appear.

W.J.S.

Scientific Name. Termites constitute the single family *Termitidae*. *Termes flavipes* is the most widely distributed of American species.

TERNS, *turns*, a subfamily of sea birds related to the gulls and distinguished for their powers of flight. The fifty or more species are found in all parts of the world, ten being native to North America. They are commonly seen on seacoasts and along rivers and lakes, rather than in the open sea. Terns have long, pointed bills, webbed feet, and strong, large, pointed wings, which carry them through the air swiftly and for long distances. The swift, graceful flight has given them the name *sea swallow*. They seize their prey, which consists of small fish, by darting quickly into the water, bill pointing downward. Gulls (which see) pick their food from the surface of the water. Great colonies of terns may be found on islands during the nesting season. The nests are usually placed in depressions in the ground, but sometimes the eggs are laid on the bare rock.

The largest species is the *Caspian tern*, a handsome bird nearly two feet long, with a crest of shining black, and pearl-gray back and wings. The smallest is the *least tern*, nine inches long. The beautiful *common tern*, once



Photos: Visual Education Service

THREE OF THE TERNS

Above, left to right, Caspian and Forrester's terns; below, the common black tern, with nest, egg, and young.

abundant on the Atlantic coast of North America, was almost exterminated by egg- and plume-hunters, but is now protected by law, and is again increasing in numbers. This bird

has light, pearl-gray plumage, with white tail and throat. It is about fifteen inches in length. Its eggs are three or four in number, varying in color from whitish to brownish, thickly spotted with brown and lavender. The species most frequently seen on marshes and lakes of the interior is the *black tern*. Other species are the *gull-billed*, *royal*, *sooty*, *love*, and *Arctic* terns. The last-named has the longest migratory flight of any bird known, traveling 22,000 miles in a year, from the Arctic Circle to the Antarctic Circle, and back again.

D.L.

Scientific Names. Terns constitute the subfamily *Sterninae* of the family *Laridae*. Most of them belong to the genus *Sterna*.

TERPSICHORE, *terp sik' o re*, one of the nine Muses, the patron of dancing, which she is said to have originated. She is represented as a laurel-crowned virgin holding a musical instrument in her hand. See **MUSES**.

TERRA, in mythology. See **TITANS**.

TERRA COTTA, an Italian term for a hard, durable, and attractive form of earthenware, made from clay of superior quality, and used in making architectural decorations, tiles, pottery, garden vases, flowerpots, monuments, fountains, mantels, chimney pieces, and similar objects. It may be produced in almost any color, but is frequently a warm shade of red or a rich cream color. Often, in the manufacture of terra cotta, clays from a number of different beds are secured. The material is weathered, ground, mixed with water, and with sand, pulverized fire brick, or other vitrifying substance, tempered, and then molded into the desired forms. The pieces, after being partially dried, are worked over by the finisher, and are then baked in large kilns. When a particular pattern is to be used several times, a model of the design is made, and a mold is taken, into which the plastic material is forced by hand.

In some large cities, the fronts of tall buildings are occasionally covered with white glazed terra cotta; such a surfacing has the advantage of being easily kept clean. Two of the largest office buildings in Chicago—the Wrigley and the Carbide and Carbon—are surfaced with terra cotta. The former is white, the latter a dark green. Yet, notwithstanding the comparative cheapness of this substance as a building material, and its durability, lightness, and resistance to heat, terra cotta is not so generally used in architecture as stone, marble, brick, and granite, and its possibilities have yet to be thoroughly tested.

Among the ancients, terra cotta was very extensively used. The Greeks and Romans employed it in making roof tiles, gutters, house ornaments, statues and statuettes, vases, tombs and coffins, imitations of metal jewelry, pot-

ters' and sculptors' molds, and numerous other objects, and it also had an important place in mural decorations in relief. In Italy, in the Middle Ages, there flourished a school of terra cotta sculpture, founded by a member of the Della Robbia family (see **ROBBIA, DELLA**). There are valuable collections of Greek and Roman terra cottas in the Louvre, the British Museum, and other museums of Europe.

TERRAPIN, *tehr' ah pin*. See **TURTLE**, subhead; **MARYLAND** (Fisheries).

TERRARIUM, *teh ra' rih um*. See **NATURE STUDY**.

TERRE HAUTE, *tehr e hoh't*, IND., the county seat of Vigo County, is situated on the Wabash River, about ten miles from the Illinois state line. Indianapolis is seventy-two miles northeast, Chicago is 178 miles north, and Saint Louis is 163 miles southwest. The name of the city, which is the French for *high ground*, refers to its situation on a high plateau on the east side of the river. It was settled in 1816 and incorporated in 1838, and is one of the oldest settlements in the state. Population, 1928, 73,500 (Federal estimate).

A feature of historical interest is Fort Harrison, with its beautiful grounds, located on the Wabash River. It was built in 1810-1811 by order of Governor William Henry Harrison, who later became ninth President of the United States, and it was under the command of Captain Zachary Taylor in 1812 [see **HARRISON, WILLIAM HENRY** (Governor of Indiana Territory)].

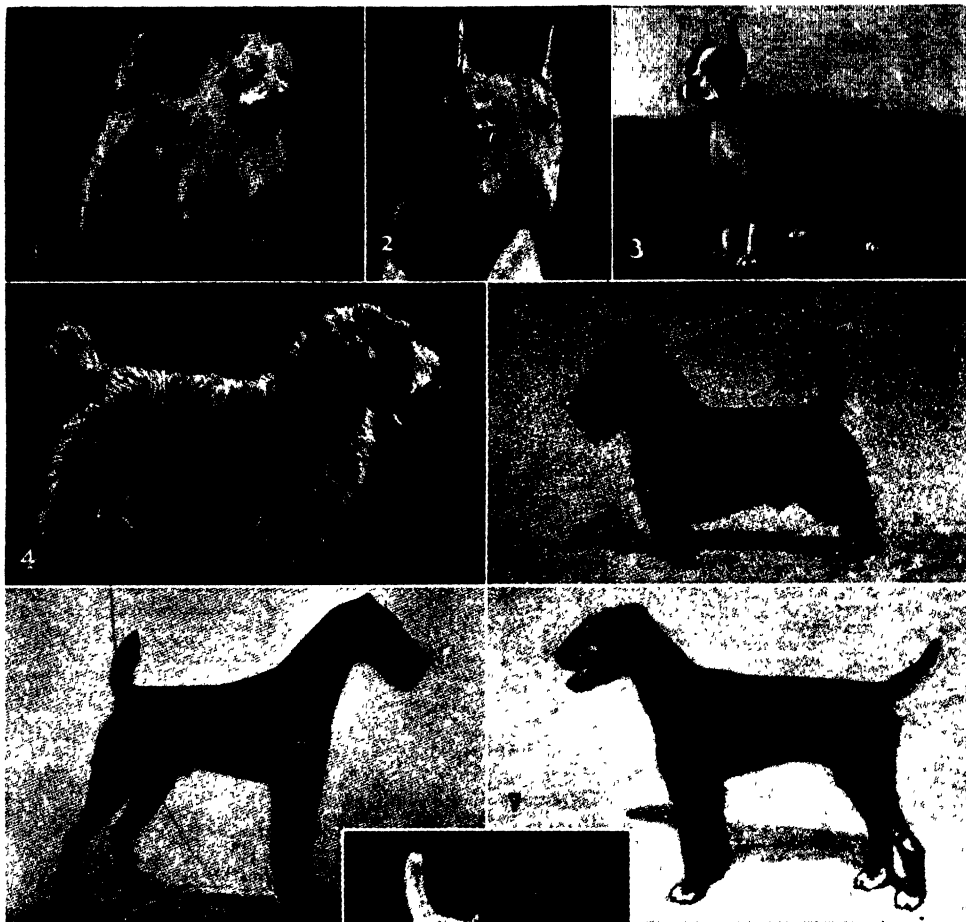
Transportation. Railway transportation is provided by the Pennsylvania, the New York Central (Big Four), the Chicago & Eastern Illinois, and the Chicago, Milwaukee, Saint Paul & Pacific railroads; interurban and motorbus lines extend in all directions.

Industries. Terre Haute is located in a region of an almost inexhaustible supply of bituminous coal, and amid immense hills of shale and clay. Coal-shipping and clay-working form the most notable industries. There are also an enameling and stamping plant and various glass works. The city has in all about 130 manufacturing industries.

Institutions. Among institutions of higher education, in or near the city, are the Indiana State Normal School, Rose Polytechnic Institute, Saint Joseph's Academy, and Saint Mary's-of-the-Woods College. The city has a memorial library, and sixteen parks covering nearly 550 acres.

TERRES MAUVAISES. See **BAD LANDS**.

TERRIER, the general name of at least fifteen kinds of dogs originally bred and trained to drive foxes from their holes, or to dig out and kill still smaller animals, such as rats and mice. The name is taken from the Latin *terra*, meaning *earth*, and refers to their method of hunting. Such work demands strength, activity, grit, and a very durable coat. The chief characteristics of terriers are gameness and grit; they appear to be absolutely fearless, yet are particularly affectionate and faithful.



SOME OF

- (1) Cairn. (2) English Bull. (3) Boston. (4) Sealyham.

The *fox* and *Scotch terriers* are among the most popular varieties. The *bull terrier*, descended from the fox terrier and bulldog, is an agreeable companion, and, while it possesses all the courage of the bulldog, it has more intelligence and vigor. It makes an excellent watch dog, being faithful and slow to make friends.

The *Airedale* has of recent years come into prominence, and is one of the largest of the terriers, weighing forty-five pounds. It is strong and courageous, a cross of the rough-haired English terrier with the otter hound. The *Irish terrier*, a good hunting dog, always maintains its important rank among lovers of dogs. It is larger than the fox terrier, with a light-red coat resembling the Scotch terrier's. The *Boston* and *black-and-tan* have many

THE TERRIERS

- (5) Scottish. (6) Welsh. (7) Airedale. (8) Fox (wire-haired).

admirers, and make interesting, intelligent pets.

With the exception of the Scotch, the breeds of dogs mentioned above are long-legged, short-bodied, rough- or smooth-coated animals, and therefore distinct from a second, long-bodied, short-legged class, including the *Scotch*, *Skye*, *Yorkshire*, and the *Dandie Dinmont*, together with the *Shantung* (like the *Skye*) of Japan and the soft-haired terrier of Malta. Terriers, with affectionate disposition, make delightful household pets, but their tempers depend on good treatment, and their health demands a daily walk or romp. M.J.H.

Related Subjects. The reader will find the following articles helpful in connection with the study of terriers:

Airedale Dog
Bulldog
Dog

Fox Terrier
Scotch Terrier
Skye Terrier



BOBBY AND BUZZY

A wise man once said that every boy should have two inseparable companions—another boy and a dog.

TERRITORIAL EXPANSION OF THE UNITED STATES. See the article UNITED STATES (Growth in Area and in Population), a subtitle.

TERRITORY, in the United States, the name given to parts of the national domain which have not yet been given statehood. In this general sense, the term has included, at various times, the following classes: (1) organized territories; (2) unorganized territories; (3) insular possessions.

The government of all territories is under the direction of Congress, to which the Constitution gives the right "to make all needful rules and regulations respecting the territory or other property belonging to the United States." The government of a territory is somewhat like that of a state, but it differs in that the authority of all territorial officials is derived from the national government. An organized territory, such as Alaska, has a governor appointed by the President, with the consent of the Senate, for a term of four years, and an elected territorial legislature, whose acts are subject to veto by Congress. The judges of the lower courts are also elected, but those of the higher courts are appointed by the President. In unorganized territories, there were no elected officials of any kind, all being appointed by the President, with the consent of the Senate. Thus the laws of the United States were ex-

tended to unorganized territories, and were, in fact, their only laws. There are now no unorganized territories.

The territories have no regular Representatives in Congress. Alaska and the Hawaiian Islands each sends one delegate (which see), who is assigned a seat in the House of Representatives; he may take part in debates which relate to his territory, and serve on committees, but he has no vote. The Philippine Islands and Porto Rico are represented in Congress by resident commissioners, whose position is similar to that of the delegates, except that they are not assigned to committees. The territories send delegates to national political conventions, with powers equal to those of other delegates.

Ordinarily, when a territory was first formed, it was unorganized; later, as its population grew, it was organized. After it had been a territory long enough to be fit for statehood, in the judgment of Congress, it was admitted to the Union. It was the general rule that a territory should not become a state until it had enough people to entitle it to one member in the House of Representatives. The last territory to be admitted to statehood was Arizona, which became a state in 1912. This act completed statehood for all of continental United States.

In Canada and Australia. In the Dominion of Canada, Manitoba, Saskatchewan, and Alberta were once under territorial government, and the Northwest Territories and Yukon Territory (both of which see) still have this form of administration. The government is similar to that of a territory in the United States. In Australia there was the Northern Territory (which see), formerly a part of South Australia, but in 1911 placed under the jurisdiction of the Commonwealth. In 1928 it was divided into the two divisions of North Australia and Central Australia. Papua, or British New Guinea, is also an Australian territory.

Related Subjects. For details of the government of the existing American territories, see the subhead *Government* in the articles on ALASKA; HAWAII; PHILIPPINE ISLANDS; PORTO RICO.

TERROR, REIGN OF. See FRENCH REVOLUTION.

TERRY, ELLEN ALICIA (1848-1928), for over fifty years one of the greatest of English actresses, and for much of this period acclaimed as the greatest woman of the stage. She was born in Coventry. Her parents were players, and they began early to train their daughter for the same career. She was but eight years old when she first appeared on the stage, taking the boy's part of Mamilus, in Shakespeare's *Winter's Tale*. For the next eight years, she played minor parts in various theaters throughout Great Britain, and then retired, in 1864,

to marry the celebrated English painter G. F. Watts. For his painting *Sir Galahad*, he used his wife as a model (see WATTS, GEORGE FREDERICK; GALAHAD, SIR, illustration).

A divorce soon followed, however, and in 1867 Miss Terry again turned to the stage, appearing as Katharine in Shakespeare's *Taming of the Shrew*. Sir Henry Irving was the leading actor in this production, and her support of his work was gaining her wide



ELLEN TERRY

At left, the great actress as she appeared on her last tour of America with Sir Henry Irving. At right, Dame Ellen Terry, as she appeared in 1925, after receiving a degree at Saint Andrew's University, Scotland.

notice when she again retired, in 1868, to marry E. A. Wardell, an actor. Seven years passed before she reentered theatrical life, and then, having once more secured a divorce, she appeared as Portia in *The Merchant of Venice*, in London. In 1878, with Irving, she played Ophelia in *Hamlet* with so much pathos and sentiment that critics gave her extravagant praise, and Irving retained her in his company as leading woman until 1902.

Miss Terry made her first tour of America with him in 1883, and met with such success, especially in highly emotional parts, that she repeated the trip nearly every year. As Portia, Lady Macbeth, Desdemona, Cordelia, and other Shakespearean women characters, she had few equals in pathos, daintiness, and grace. Nor was her ability confined to the older dramas. In such modern plays as *Alice-Sit-by-the-Fire*, by J. M. Barrie, and *Captain Brassbound's Conversion*, by Bernard Shaw, her acting showed her remarkable grasp of modern social conditions and manners. On April 28, 1906, she celebrated her stage jubilee, the fiftieth anniversary of her first appearance as an actress, and it seemed as though all London turned out to honor her. On that occasion, a purse of \$40,000 was presented to her in the name of British theatergoers.

During the next year, she surprised her thousands of admirers by marrying, at Pittsburgh, a young American actor, James Carew. Her last regular appearance on the stage occurred in 1919, when she played the nurse in Doris Keane's production of *Romeo and Juliet*, in London. In 1925 King George conferred on her the honor of Dame Grand Cross of the Most Excellent Order of the British Empire. The last decade of her life, of eighty years, was spent with her children in England. Her body was cremated, and the ashes were placed in Saint Paul's, London.

TERTIARIES, *tur' shih a riz*, a religious order of the Franciscans (which see).

TERTIARY PERIOD, the earlier of the two periods of the Cenozoic Era, succeeding the Cretaceous Period and succeeded by the Quaternary Period. The name, which means *third*, is a survival of an early classification, in which the rocks now named Paleozoic were called Primary, and those now named Mesozoic were called Secondary. The period is divided into four epochs—Eocene, Oligocene, Miocene, and Pliocene—which some geologists regard as periods. Most of the existing genera and species of animals and plants originated during the Tertiary Period, although many of the characteristic forms of life of that time are now extinct.

L.LaF.

Related Subjects. For a fuller understanding of this period, the reader is referred in these volumes to the following articles:

Cenozoic Era	Miocene Epoch
Eocene Epoch	Oligocene Epoch
Evolution	Pliocene Epoch
Geology	Quaternary Period

TESCHEN, *tesh' en*, **TREATY OF SUCCESSION WARS.**

TESLA, *tes' lah*, NIKOLA (1857-), a famous electrician, the inventor of numerous electrical devices, was born in Smiljan, in Austrian Croatia. His studies at the Gratz Polytechnic School aroused an interest in engineering and electricity, and when he went to Prague and Budapest, he continued work in these subjects, while pursuing courses in languages and philosophy. After being employed in the government telegraphic-engineering department of Austria, he became an engineer in Paris, then set out for America, and for a time was under the direction of Thomas A. Edison.

For purposes of independent research, Tesla established electrical laboratories in New York City, and his resulting inventions have been distinguished alike for their brilliance and for their practicability. He was the first to substitute the alternating current for the direct current—a simpler and more economical method of converting electrical into mechanical energy. His principle of the rotary magnetic field is now in use in transmitting the power of Niagara Falls to near-by cities. His other inventions

include improvements in dynamos, arc lights, incandescent lamps, condensers, and induction coils.

TESTA, outer coat of a seed. See **GERMINATION**.

TEST ACTS, the general name given to certain religious acts passed by the English Parliament, which were intended to prevent any but members of the Established Church from holding public office. Among the principal test acts were the Corporation Act of 1661, which decreed that all magistrates must take oaths of allegiance and supremacy, and must receive communion according to the Church of England; and the Test Act of 1672, which prescribed the same tests for the holders of public offices. All such laws were eventually repealed.

TESTATOR. See **WILL**.

TESTATRIX, *tes ta' triks*. See **WILL**.

TETANUS, *tel' a nus*, the medical term for lockjaw (which see). See, also, **PASTEUR**, **LOUIS**.

TETON, **GRAND**. See **PARKS**, **NATIONAL** (Grand Teton National Park).

TETRAGONAL, *tel rag' o nal*, **SYSTEM**. See **CRYSTALLIZATION**.

TETRAMETER, *tel ram' e tur*. See **METER**.

TETRARCH, *te' trahrk*, or *tel' rahrk*, a Greek title for the governor of the fourth part of a country. In the later Roman Empire, it was a title given to all minor rulers possessing sovereign rights, but dependent upon the emperor, especially in the East. The princes of the family of Herod, in Syria, were all called by this title. See **HEROD**.

TETRAZZINI, *tel raht se' ne*, **LUISA** (1874-), one of the greatest coloratura sopranos of the modern operatic stage. At the height of her powers, she possessed a voice remarkable for its range and for the purity of its high staccato notes. She received her musical education in her native city, Florence, making her professional début there in 1895, as Inez in *L'Africaine*. Although she attained considerable success in Italy, Russia, South America, and Mexico, it is San Francisco which claims the honor of having "discovered" Tetrazzini, and of having first acclaimed her as a second Patti.

In 1908 she repeated her triumphs at the Metropolitan Opera House in New York, singing there the part of Violetta in *La Traviata*, and thereafter was an established favorite in grand-opera and concert work in various

American cities. Her repertory embraced about forty rôles, including the leading soprano parts in *Rigoletto*, *La Sonnambula*, *Lucia di Lammermoor*, *Lakme*, and *The Cobbler and the Fairy*. In 1926 she was married in Rome to Pietro Vernati, son of a shirt-maker, and her junior by about twenty-five years. They were legally separated in 1929.

TETZEL, *tel' sel*, **JOHANN** (about 1460-1519), a German monk of the Dominican Order, famous as the opponent of Martin Luther at the beginning of the Reformation. Tetzel was born in Leipzig, and was educated at the university of that city. Soon after his graduation, in 1487, he joined the Dominican brotherhood, and speedily became known as an eloquent preacher. In 1517 he appeared in the vicinity of Wittenberg, where he preached to the people concerning the granting of indulgences to those who would contribute to the fund for building Saint Peter's, at Rome. Luther's famous ninety-five theses were directed against Tetzel's methods, and they caused intense excitement throughout Germany. Tetzel himself published a series of theses answering Luther, but his course had been such as to offend the authorities of the Church; a few months before his death, he was summoned to appear before the Papal legate, and was rebuked for extravagant language and improper conduct.

Related Subjects. The reader is referred in these volumes to the following articles:

Luther, Martin Reformation, The Saint Peter's Church

TEUTOBURG, *toi' toh boorK*, **FOREST**. See **GERMANY** (Climate and Life Forms).

TEUTOBURG FOREST, **BATTLE OF**. See **FIFTEEN DECISIVE BATTLES**.

TEUTONIC RACES, the term applied to a branch of the Aryan, or Indo-European, family. At the present time, it is divided into two principal divisions. These are the Scandinavians, including the Danes, Swedes, Norwegians, and Icelanders; and the Germanic, including the German-speaking people of Germany proper, Austria, Switzerland, and the Netherlands; the Flemings of Belgium; and the descendants of the Anglo-Saxons in Great Britain and America. The Teutonic peoples, however, represent a Low German branch of Gothic stock. Strictly speaking, the Anglo-Saxons represent a fusion of the ancient peoples of Britain with the Jutes, Angles, and Saxons. Indeed, the Anglo-Saxon language was a composite speech of the peoples born in the British Isles, and was never spoken as the language of any people on the Continent. Anglo-Saxon is a term used to distinguish these peoples from the Old Saxons on the Continent. c.w.

TEWFIK, *tu' fik*. See **EGYPT** (Nineteenth-Century Egypt).



TETRAZZINI

TEWKESBURY, an ancient town in Gloucestershire, England, on the River Avon, near its junction with the Severn. It was the site of a Roman encampment in the days of the ancient Britons, and of a Saxon castle and monastery. In 1066 it was a market town, and was incorporated in 1574.

BATTLE OF, an engagement in 1471 whereby Edward IV definitely established his claim to the throne of England. See **EDWARD (IV, England)**.

TEXARKANA, *ték sáhr hán'*, **ak, TEX.**, and **TEXARKANA, ARK.** See back of map, both states.

State Capitol, Austin

The STORY of TEXAS

TEXAS is one of the South-Central states and the largest state in the American Union. It is no longer a lonely plain, but, rich in natural resources, it is to-day a progressive and a prosperous state. Unlike any other state, it was an independent republic when admitted into the Union (see subtitle *History*, below). It was named for the Tejas Indians, a federation of tribes of the territory; *friends* is given as the probable meaning of the name. Texas is popularly known as the **LONE STAR STATE**, because of the single star in the flag of the republic. The bluebonnet is the state flower, and the graceful pecan, which grows more abundantly in Texas than in any other part of the world, is the state tree.

Irvin Cobb, novelist, departs from fiction to describe Texas as having—

a timbered tract as large as Massachusetts; a cotton patch, in the Black Waxey country, as big as all Ohio; a grazing belt in the Panhandle as large as Pennsylvania, more wheat lands than either of the Dakotas, and more corn lands than Illinois can boast. If Arizona should run short of desert, Texas, out of her Staked Plains, could furnish all the desert Arizona could find room for, and never miss what it gave away. At the same hour bananas are ripening in one part of Texas, and blizzards in another.

First in size, first in crop values, first in cotton production, second in exports among the states in mineral and forest products, a state of great ranches, thriving cities, and oil wells—that is Texas to-day.

Not long ago, it was most notable as a vast cattle country. Across it ran the Long Trail, and on its plains roamed thousands of cattle, descendants of the "longhorn" cattle of Spanish and Mexican days.

Perhaps no other state in the Union has such tremendous possibilities for the future. Texas can easily double its population and not be crowded; agriculture and mining, despite their already great returns, are capable of still greater development. Industry in Texas has at its command a wealth of raw material—cotton, wool, mohair; minerals; all the varied products of agriculture; the coal, gas, oil, and water power for cheap manufacture; and railways and ports for transportation. In this direction, perhaps, will come the greatest development of the future.

Size and Location. Having an area of 265,896 square miles, Texas is larger than the states of Michigan, Wisconsin, Iowa, Illinois, and Indiana combined. It is much larger than any country in Europe except Soviet Russia. Point Isabel, on the Gulf coast, and Texline, a town on the Texas-New Mexico border, are 1,107 miles apart; and this distance is 200 miles more than the shortest rail route between Chicago and New York.

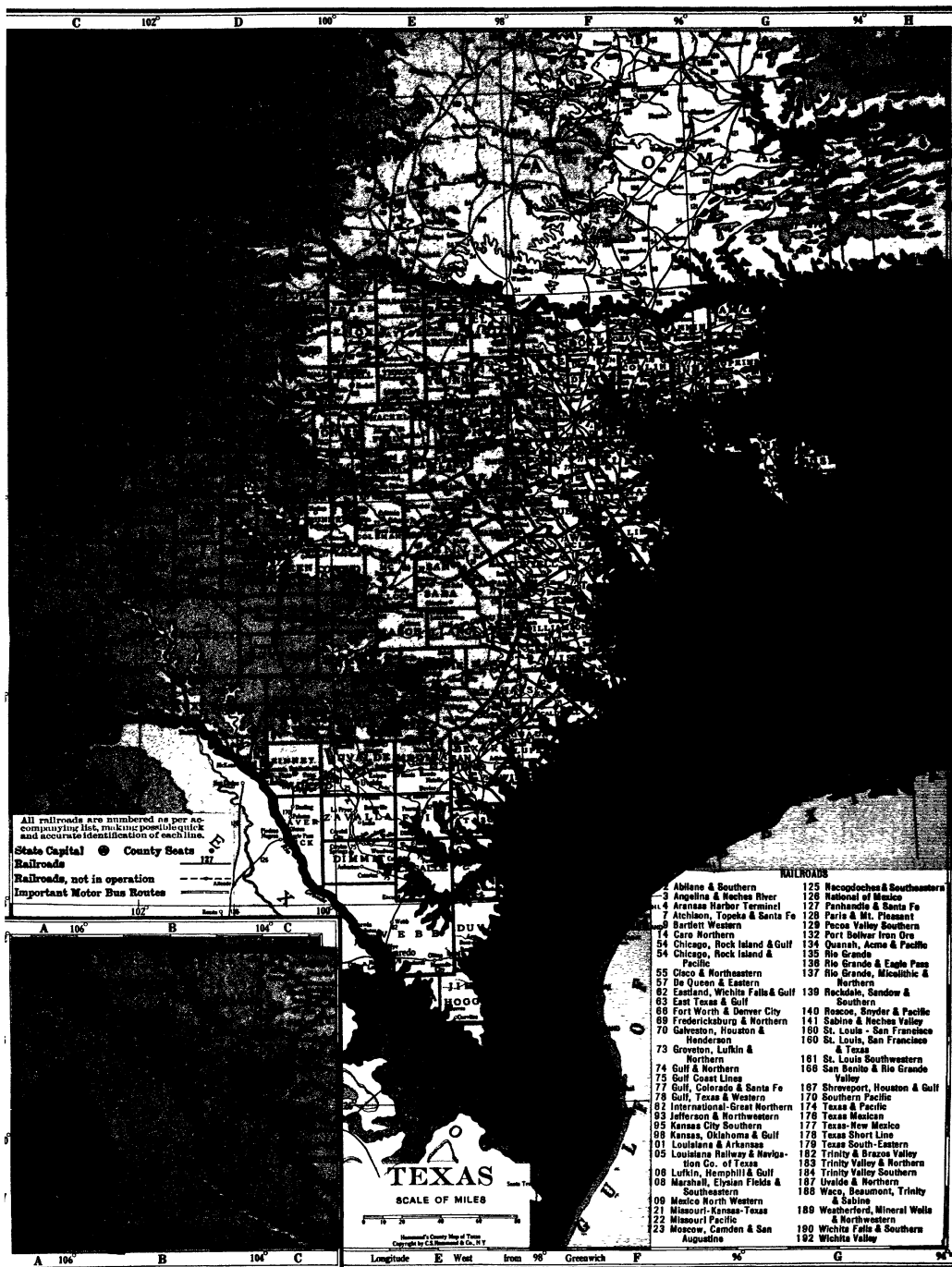
With the exception of Florida, Texas is the southernmost state in the Union; it is midway between the Arctic Circle and the equator, and equidistant from the Atlantic and Pacific oceans. Mexico forms its southwestern boundary, the Gulf of Mexico its southeastern; Louisiana and Arkansas on the east, Oklahoma on the north, and New Mexico on the west, complete the boundaries of this vast state.

Some idea of the tremendous size and resources of the state can be given by quoting from a Texas almanac:

Texas has in its pine timber belt an area as large as Indiana; an area along the coast, having a sub-tropical climate, equal to the area of South Carolina;

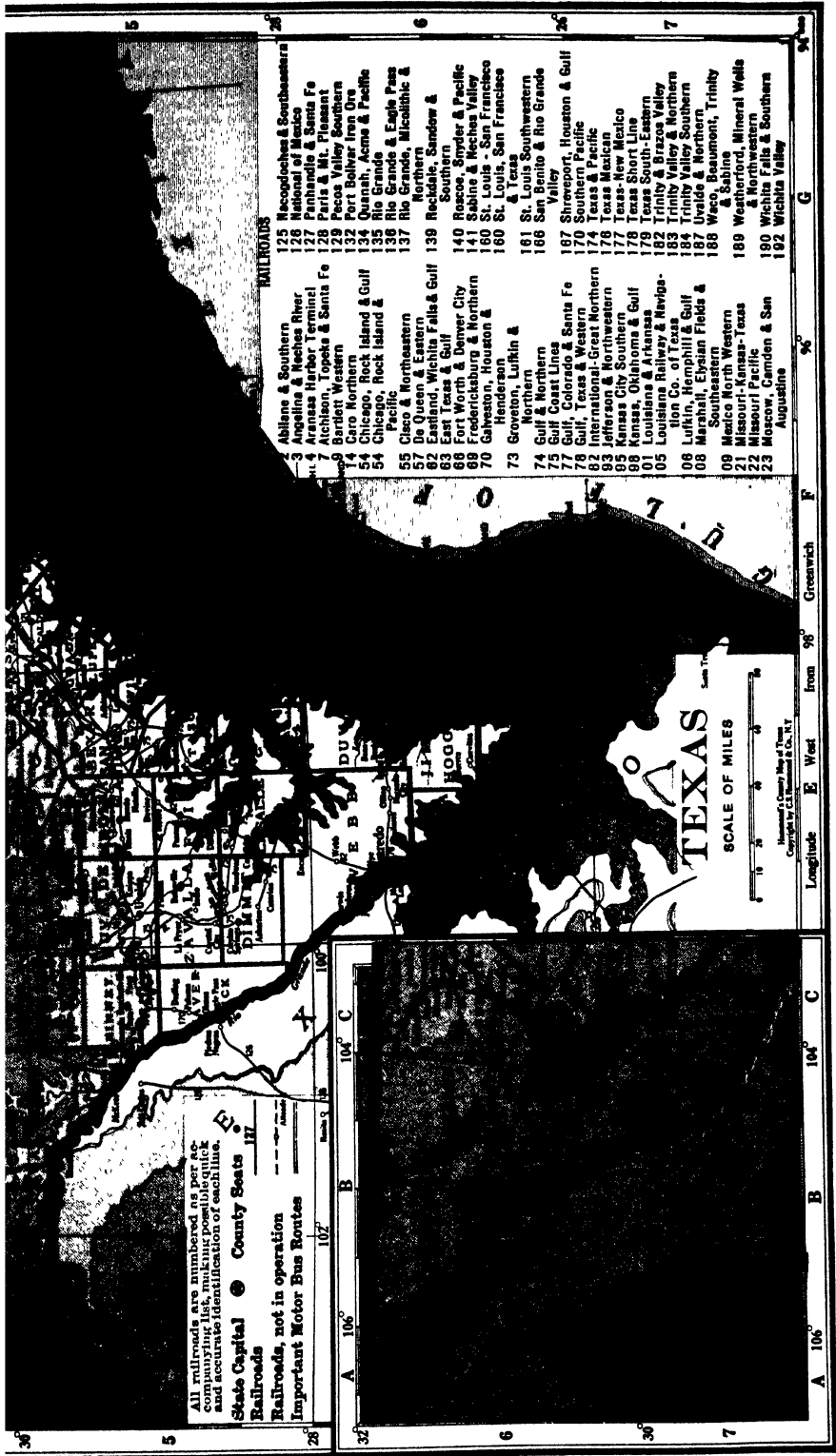
ILAS

Abbeville (F4)	288	Adams (F3)	608	Cockrell Hill (F3)	459	Emory (G3)	808
Abbeville (F5)	288	Adams (F4)	620	Coldspring (G4)	480	Enclinal (G5)	678
Abbeville (F6)	19,174	Adams (F5)	12,000	Coleman (E4)	2,868	Enloe (G3)	988
Abbeville (F7)	288	Adams (F6)	380	Collegeport (F5)	250	Ennis (F3)	7,224
Abbeville (F8)	288	Adams (F7)	200	Collinsville (F3)	837	Ero (G3)	308
Abbeville (F9)	288	Adams (F8)	3,179	Colmesneil (G4)	600	Estelline (G2)	394
Abbeville (F10)	288	Adams (F9)	418	Colorado (D3)	1,766	Eustace (G3)	490
Alba (G3)	1,352	Adams (F10)	1,600	Columbus (F5)	2,800	Evadale (H4)	300
Albany (E5)	1,469	Adams (F11)	2,197	Comanche (E4)	3,524	Evant (E4)	310
Adado (F3)	480	Adams (F12)	387	Comfort (E5)	1,000	Fabens (A6)	1,580
Alexander (E5)	800	Adams (F13)	1,846	Commerce (F3)	3,842	Fairfield (F4)	950
Alfred (F4)	200	Adams (F14)	1,100	Como (G3)	827	Fallfurris (E6)	2,100
Aliza (E6)	1,880	Adams (F15)	5,066	Comstock (D5)	300	Falls City (F5)	600
Allen (F5)	460	Adams (F16)	1,872	Conroe (G4)	1,858	Farmersville (F3)	2,167
Alpine (C6)	931	Adams (F17)	350	Coolidge (F4)	880	Farwell (C2)	780
Alto (G4)	1,081	Adams (F18)	950	Cooper (G3)	2,563	Fate (F3)	299
Alvarado (F3)	1,284	Adams (F19)	529	Copperas Cove (F4)	509	Fayetteville (F5)	390
Alvin (E6)	1,519	Adams (F20)	900	Corpus Christi (F6)	10,522	Fentress (F5)	350
Alvord (F3)	1,376	Adams (F21)	1,500	Corrigan (G4)	800	Ferris (F3)	1,586
Amarillo (C2)	15,494	Adams (F22)	11,791	Corisana (F3)	11,356	Flatonia (F5)	995
Amaretto (C3)	700	Adams (F23)	8,223	Cotulla (E5)	1,058	Florence (F4)	760
Anahane (G5)	500	Adams (F24)	6,307	Crandall (F3)	700	Floresville (E5)	1,518
Anderson (G4)	600	Adams (F25)	320	Crane (C4)	1,250	Floyd (D2)	250
Andrews (C3)	320	Adams (F26)	510	Crawford (F4)	573	Floydada (D3)	1,384
Angleton (G5)	1,043	Adams (F27)	550	Cresson (F3)	300	Flynn (G4)	250
Anna (F3)	538	Adams (F28)	160	Crockett (G4)	3,061	Follett (D1)	750
Annona (G3)	650	Adams (F29)	510	Crobyton (D3)	809	Forney (F3)	1,345
Anson (D3)	1,425	Adams (F30)	500	Cross Plains (E3)	700	Fort Hancock (B6)	240
Anton (C3)	350	Adams (F31)	5,300	Crowell (E3)	1,175	Fort McKavett (D4)	170
Apple Springs (G4)	450	Adams (F32)	230	Crystal City (E5)	2,000	Fort Stockton (C4)	1,297
Aquila (F4)	560	Adams (F33)	241	Cuero (F5)	3,671	Fort Worth (F3)	106,482
Aransas Pass (F6)	1,569	Adams (F34)	966	Cumby (G3)	945	Humble (G4)	3,820
Archer City (E3)	689	Adams (F35)	600	Cushing (G4)	1,200	Huntington (G4)	7,000
Arlington (F3)	3,031	Adams (F36)	620	Daingerfield (G3)	843	Huntsville (G4)	4,600
Arp (G3)	360	Adams (F37)	480	Daisetta (G4)	2,000	Hutto (F4)	5,000
Ashterton (E5)	1,600	Adams (F38)	590	Dalhart (C1)	2,676	Idalou (D3)	50
Aspermont (D3)	436	Adams (F39)	1,689	Dallas (F3)	158,976	Independence Heights (G5)	71
Athens (G3)	3,176	Adams (F40)	250	Dalworth Park (F3)	332	Freeport (G5)	1,798
Atlanta (G3)	1,469	Adams (F41)	500	Damon (G5)	350	Frisco (C2)	1,904
Aubrey (F3)	850	Adams (F42)	2,099	Darrouzett (D1)	250	Frisco (F3)	733
AUSTIN (F4)	34,876	Adams (F43)	300	Dawson (G5)	950	Frost (F3)	913
Austwell (F5)	213	Adams (F44)	4,298	Dayton (G5)	2,100	Gail (D3)	270
Avery (G3)	900	Adams (F45)	583	Decatur (F3)	2,205	Gainesville (F3)	8,648
Avenger (G3)	520	Adams (F46)	600	DeKalb (G3)	910	Galveston (G5)	44,255
Avoca (E3)	210	Adams (F47)	2,187	De Leon (E3)	3,302	Garland (F3)	716
Bagwell (G3)	400	Adams (F48)	200	Del Rio (D5)	10,589	Garland (F3)	1,421
Baird (E3)	1,902	Adams (F49)	583	Denison (F3)	17,065	Garrison (G4)	603
Ballinger (D4)	2,767	Adams (F50)	300	Dennis (F3)	250	Garwood (F5)	500
Balmorhea (C6)	350	Adams (F51)	1,618	Denton (F3)	7,626	Gary (G3)	510
Bandera (E5)	500	Adams (F52)	741	Deport (G3)	821	Gatesville (F4)	2,499
Banga (E4)	709	Adams (F53)	250	Desdemona (E3)	3,008	Georgetown (F4)	2,871
Bardwell (F3)	358	Adams (F54)	220	Detroit (G3)	1,500	George West (E5)	600
Barkdale (D5)	200	Adams (F55)	220	Devers (G3)	300	Giddings (F4)	1,650
Barstow (C6)	490	Adams (F56)	650	Devine (E5)	995	Gilmer (G3)	2,268
Bartlett (F4)	1,731	Adams (F57)	954	D'Hanis (E5)	600	Gladewater (G3)	900
Bastrop (F4)	1,828	Adams (F58)	573	Diboll (G4)	400	Gladstiel (G4)	250
Batesville (E5)	400	Adams (F59)	1,366	Dickens (D3)	300	Glaizer (D1)	250
Bay City (F5)	3,454	Adams (F60)	510	Dilley (E5)	1,000	Glenfiora (F5)	500
Baytown (G5)	2,000	Adams (F61)	300	Dimmitt (C2)	400	Glen Rose (F3)	990
Beaumont (H4)	40,422	Adams (F62)	480	Dobbin (G4)	300	Glidden (E5)	320
Beckville (G3)	710	Adams (F63)	1,022	Dodd City (F3)	495	Godley (F3)	650
Beeville (F5)	3,063	Adams (F64)	1,126	Dodge (G4)	350	Goldthwaite (E4)	1,214
Bellevue (E3)	782	Adams (F65)	878	Dodsonville (D2)	540	Goliad (F5)	2,200
Bells (F3)	585	Adams (F66)	1,838	Donie (F4)	350	Gonzales (F5)	3,128
Bellville (F4)	2,000	Adams (F67)	600	Donna (E6)	1,579	Goodnight (D2)	280
Belton (F4)	5,098	Adams (F68)	500	Doucette (G4)	470	Goree (E3)	614
Benavides (E6)	750	Adams (F69)	520	Driscoll (F6)	500	Gorman (E3)	3,200
Benjamin (E3)	450	Adams (F70)	510	Dublin (E3)	3,229	Grafado (E3)	600
Benjamin (F3)	280	Adams (F71)	980	Dumas (D2)	250	Graham (E3)	2,544
Berclair (F4)	700	Adams (F72)	300	Dundee (E3)	350	Granbury (F3)	1,364
Bertram (F4)	1,000	Adams (F73)	300	Eagle Lake (F5)	2,017	Grand Prairie (F3)	1,263
Best (D4)	390	Adams (F74)	650	Eagle Pass (D5)	5,765	Grand Saline (G3)	1,528
Bettie (G3)	220	Adams (F75)	260	East Bernard (F5)	650	Grandview (F3)	1,084
Bigfoot (E5)	220	Adams (F76)	1,000	Eastland (E3)	9,368	Granger (F4)	1,944
Big Lake (D4)	500	Adams (F77)	5,003	East Mayfield (H4)	1,968	Grapeland (G4)	1,250
Big Sandy (G3)	658	Adams (F78)	1,351	Ector (F3)	454	Grapevine (F3)	821
Big Spring (D3)	4,273	Adams (F79)	500	Edcouch (E6)	300	Grayburg (G4)	1,406
Big Wells (E5)	500	Adams (F80)	259	Eddy (F4)	593	Greenville (G3)	12,384
Bishop (F6)	1,200	Adams (F81)	250	Eden (E4)	593	Gregory (F6)	400
Blackwell (D3)	450	Adams (F82)	7,422	Edgewood (G3)	820	Groesbeck (F4)	1,522
Blanco (E4)	500	Adams (F83)	2,456	Edinburg (E6)	1,406	Groom (D2)	600
Blanket (E4)	472	Adams (F84)	3,386	Edna (F5)	2,200	Groveton (G4)	1,103
Blodoo (C3)	300	Adams (F85)	770	El Campo (F5)	1,766	Gunter (F3)	575
Bloomburg (H3)	436	Adams (F86)	500	Eldorado (D4)	800	Guthrie (E4)	570
Bloomington (F3)	898	Adams (F87)	1,327	Electra (E2)	4,744	Guthrie (D3)	250
Blossom (G3)	969	Adams (F88)	1,300	Elgin (F4)	1,630	Hale Center (D2)	900
Bluegrove (E3)	200	Adams (F89)	1,300	Elkhardt (G4)	850	Hallettsville (F5)	1,444
Bluff Dale (E3)	650	Adams (F90)	1,327	El Paso (A6)	77,560	Hallsville (G3)	800
Blum (F3)	496	Adams (F91)	610	Elysian Fields (G3)	410	Hamilton (E3)	2,018
Boerne (E5)	1,153	Adams (F92)	500	Emhouse (F3)	347	Hamlin (D3)	1,633
Bogata (G3)	1,000	Adams (F93)	600			Hankamer (G5)	220
Bomarton (E3)	600	Adams (F94)	600				
Bonham (F3)	6,008	Adams (F95)	600				
		Adams (F96)	620				
		Adams (F97)	12,000				
		Adams (F98)	380				
		Adams (F99)	200				
		Adams (F100)	3,179				
		Adams (F101)	418				
		Adams (F102)	1,600				
		Adams (F103)	2,197				
		Adams (F104)	387				
		Adams (F105)	1,846				
		Adams (F106)	1,100				
		Adams (F107)	5,066				
		Adams (F108)	1,872				
		Adams (F109)	350				
		Adams (F110)	950				
		Adams (F111)	529				
		Adams (F112)	900				
		Adams (F113)	1,500				
		Adams (F114)	11,791				
		Adams (F115)	8,223				
		Adams (F116)	6,307				
		Adams (F117)	320				
		Adams (F118)	510				
		Adams (F119)	550				
		Adams (F120)	160				
		Adams (F121)	510				
		Adams (F122)	500				
		Adams (F123)	400				
		Adams (F124)	500				
		Adams (F125)	5,300				
		Adams (F126)	230				
		Adams (F127)	241				
		Adams (F128)	966				
		Adams (F129)	600				
		Adams (F130)	620				
		Adams (F131)	480				
		Adams (F132)	590				
		Adams (F133)	1,689				
		Adams (F134)	250				
		Adams (F135)	500				
		Adams (F136)	2,099				
		Adams (F137)	300				
		Adams (F138)	4,298				
		Adams (F139)	583				
		Adams (F140)	600				
		Adams (F141)	2,187				
		Adams (F142)	200				
		Adams (F143)	583				
		Adams (F144)	300				
		Adams (F145)	1,618				
		Adams (F146)	741				
		Adams (F147)	250				
		Adams (F148)	220				
		Adams (F149)	220				
		Adams (F150)	650				
		Adams (F151)	954				
		Adams (F152)	573				
		Adams (F153)	1,366				
		Adams (F154)	510				
		Adams (F155)	300				
		Adams (F156)	480				
		Adams (F157)	1,022				
		Adams (F158)	1,126				
		Adams (F159)	878				
		Adams (F160)	1,838				
		Adams (F161)	600				
		Adams (F162)	500				
		Adams (F163)	520				
		Adams (F164)	510				
		Adams (F165)	980				
		Adams (F166)	300				
		Adams (F167)	300				
		Adams (F168)	650				
		Adams (F169)	260				
		Adams (F170)	1,000				
		Adams (F171)	5,003				
		Adams (F172)	1,351				
		Adams (F173)	500				
		Adams (F174)	259				
		Adams (F175)	250				
		Adams (F176)	7,422				
		Adams (F177)	2,456				
		Adams (F178)	3,386				
		Adams (F179)	770				
		Adams (F180)	500				
		Adams (F181)	1,327				
		Adams (F182)	1,300				
		Adams (F183)	1,327				
		Adams (F184)	610				
		Adams (F185)	500				
		Adams (F186)	600				
		Adams (F187)	600				
		Adams (F188)</					



0 fathoms and over
 0-10 fathoms
 10-20 fathoms
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 30-40 fathoms
 40-50 fathoms
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 60-70 fathoms
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 4000-5000 ft.
 5000-6000 ft.
 6000-7000 ft.
 7000-8000 ft.
 8000-9000 ft.
 9000-10,000 ft.

How to Read a Map: See page xvi, facing text page 1



All railroads are numbered as per the Texas Railroad Commission's list and are identified by the number in parentheses and accurate identification of each line.

State Capital ● **County Seats** ●

Railroads ———

Bus Routes - - - - -

Important Motor Bus Routes ———

RAILROADS

- 125 Abilene & Southern
- 126 Abilene & Wichita Falls
- 127 Abilene & Santa Fe
- 128 Abilene & Santa Fe
- 129 Abilene & Santa Fe
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- 198 Abilene & Santa Fe
- 199 Abilene & Santa Fe
- 200 Abilene & Santa Fe

How to Read a Map: See page xvi, facing text page 1.

Engraved and printed expressly for THE WORLD BOOK

10 fathoms and over

9-10 fathoms

0-5 fathoms

Sea level

100-500 ft.

500-1000 ft.

1000-2000 ft.

2000-3000 ft.

3000-5000 ft.

5000-10,000 ft.

100° 10' C

104° C

106° B

108° A

100° E

102° F

104° G

106° H

108° I

110° J

112° K

114° L

116° M

118° N

120° O

122° P

124° Q

126° R

128° S

130° T

132° U

134° V

136° W

138° X

140° Y

142° Z

144° AA

146° AB

148° AC

150° AD

152° AE

154° AF

156° AG

158° AH

160° AI

162° AJ

164° AK

166° AL

168° AM

170° AN

172° AO

174° AP

176° AQ

178° AR

180° AS

182° AT

184° AU

186° AV

188° AW

190° AX

192° AY

194° AZ

196° BA

198° BB

200° BC

TEXAS Continued

Langtry, (D5).....	280	Midland, (C3).....	1,795	Paxton, (G3).....	250	Sabinal, (E5).....	1,458	Three Rivers, (E5) 1,000	
La Porte, (G5).....	889	Midlothian, (F3).....	1,298	Peacock, (D3).....	400	Sabine, (G5).....	360	Throckmorton, (E3) 686	
La Pryor, (E5).....	550	Mikaska, (F5).....	210	Pearshall, (E5).....	2,161	Sabine Pass, (G5).....	330	Thurber, (E3).....	3,000
Laredo, (E6).....	22,710	Miles, (D4).....	853	Pecos, (C6).....	1,445	Sagerton, (D3).....	380	Tilden, (E5).....	350
Larue, (G3).....	490	Milford, (F3).....	940	Peniel, (F3).....	571	Saint Jo, (F3).....	985	Timpson, (G4).....	1,526
Lavonia, (E5).....	400	Millett, (E5).....	210	Perrin, (F3).....	500	San Angelo, (D4).....	10,050	Tioga, (F3).....	777
Lawn, (E3).....	500	Minden, (G3).....	300	Perryton, (D1).....	1,800	San Antonio, (E5) 161,379		Tolar, (F3).....	416
League City, (G5).....	810	Mincola, (G3).....	2,299	Petrolia, (E3).....	914	San Augustine, (H4) 1,268		Tolbert, (E2).....	230
Leakey, (E5).....	300	Mineral Wells, (E3) 7,890		Pettus, (F5).....	250	San Benito, (F6).....	5,070	Tomball, (G4).....	350
Leesville, (F5).....	310	Mingus, (E3).....	1,100	Pflugerville, (F4).....	450	Sanderson, (C4).....	1,000	Tom Bean, (F3).....	367
Lefors, (D2).....	250	Mirando City, (E6) 1,200		Pharr, (E6).....	1,565	San Diego, (E6).....	1,000	Tornillo, (A6).....	300
Legion, (E5).....	400	Mission, (E6).....	3,847	Pilot Point, (F3).....	1,499	San Elizario, (A6).....	330	Toyah, (C6).....	1,052
Leonard, (F3).....	1,383	Moebette, (D2).....	260	Pineland, (H4).....	400	San Felipe, (F5).....	451	Trent, (D3).....	700
Levelland, (C3).....	700	Monahans, (C4).....	260	Pioneer, (E3).....	650	Sanger, (F3).....	1,204	Trenton, (F3).....	616
Lewisville, (F3).....	950	Montague, (F3).....	300	Pittsburg, (G3).....	2,540	San Juan, (E6).....	1,203	Trinity, (G4).....	1,363
Lexington, (F4).....	600	Montalba, (G4).....	260	Plainview, (D2).....	3,989	San Marcos, (E5).....	4,527	Troup, (G3).....	1,258
Liberty, (G4).....	1,117	Montgomery, (G4) 700		Plano, (F3).....	1,715	San Saba, (E4).....	2,011	Troy, (F4).....	490
Lincoln, (F4).....	200	Moody, (F4).....	1,106	Pleasanton, (E5).....	1,036	Santa Anna, (E4).....	207	Truscott, (E3).....	450
Lindale, (G3).....	701	Moore, (E3).....	350	Point, (G3).....	400	San Ygnacio, (E6).....	210	Tulia, (D2).....	1,189
Linden, (G3).....	702	Moran, (E3).....	1,055	Point Isabel, (F6) 320		Saratoga, (G4).....	1,200	Turkey, (D2).....	630
Lipecomb, (D1).....	300	Morgan, (F4).....	672	Polytechnic, (F3).....	4,338	Savoy, (F3).....	378	Tuscola, (E3).....	430
Littlefield, (C3).....	2,000	Morton, (C3).....	200	Pontotoc, (E4).....	260	Schulenburg, (F5) 1,246		Tyler, (G3).....	12,085
Livingston, (G4).....	928	Moscow, (G4).....	250	Poolville, (F3).....	400	Seadrift, (F5).....	321	Tyran, (F5).....	300
Llano, (E4).....	1,645	Mount Calm, (F4) 626		Port Arthur, (H5) 22,251		Seagraves, (C3).....	700	Utopia, (E5).....	310
Lockhart, (F5).....	3,731	Mount Enterprise, (G4).....	850	Port Lavaca, (F5) 1,213		Sealy, (F5).....	2,000	Uvalde, (E5).....	3,885
Lockney, (D2).....	1,118	(G4).....		Port Neches, (H5) 1,500		Sebastian, (F6).....	350	Valentine, (B6).....	340
Lometa, (E4).....	995	Mount Pleasant, (G3).....	4,099	Port O'Connor, (F5) 300		Seguin, (F5).....	3,631	Valera, (F4).....	350
Londra, (E4).....	200	(G3).....		Post, (D3).....	1,436	Seminole, (C3).....	510	Valley Mills, (F4).....	855
Lone Oak, (G3).....	1,017	Mount Selman, (G3) 250		Poteet, (E5).....	950	Seymour, (E3).....	2,121	Valley View, (F3).....	630
Longview, (G3).....	5,713	Mount Vernon, (G3).....	250	Poth, (E5).....	520	Shallowater, (C3).....	350	Van Alstyne, (F3).....	1,588
Longworth, (D3).....	200	(G3).....	1,212	Pottsboro, (F3).....	454	Shamrock, (D2).....	1,227	Van Horn, (B6).....	600
Loraine, (D3).....	610	Muenster, (F3).....	510	Premont, (E6).....	600	Shepherd, (G4).....	330	Vashti, (E3).....	210
Lorenzo, (D3).....	1,000	Muleshoe, (C2).....	800	Presidio, (B7).....	800	Sheridan, (F4).....	250	Vega, (C2).....	500
Lott, (F4).....	1,093	Mullin, (E4).....	558	Princeton, (F3).....	500	Sherman, (F3).....	15,031	Venus, (F3).....	842
Lovelsdy, (G4).....	625	Munday, (E3).....	998	Pritchett, (G3).....	250	Shiner, (F5).....	1,300	Vernon, (E2).....	5,142
Loving, (E3).....	350	Murchison, (G3).....	350	Proctor, (E4).....	343	Sierra Blanca, (B6) 416		Victoria, (F5).....	5,957
Lubbock, (D3).....	4,051	Myra, (F3).....	350	Prosper, (F3).....	343	Silbee, (G4).....	1,800	Village Mills, (G4).....	200
Lueders, (E3).....	4,878	Nacogdoches, (G4) 3,546		Purdon, (F3).....	700	Silverton, (D2).....	416	Waco, (F4).....	38,500
Lufkin, (F5).....	1,502	Naples, (G3).....	887	Putnam, (E3).....	400	Sinton, (F5).....	1,058	Waelder, (F5).....	894
Luling, (F6).....	1,502	Nash, (G3).....	250	Pyote, (C4).....	270	Skidmore, (F5).....	600	Waller, (G4).....	920
Lyford, (F5).....	390	Navasota, (G4).....	5,060	Quail, (D2).....	3,691	Slaton, (D3).....	1,525	Wallis, (F5).....	510
Lyness, (F4).....	5,331	Neches, (G4).....	360	Quannah, (E2).....	398	Smithville, (F5).....	3,204	Walnut Springs, (F3).....	1,449
McAllen, (E6).....	3,000	Neuville, (H4).....	578	Queen City, (G3).....	398	Snyder, (D3).....	2,179	Waring, (E5).....	210
McCamery, (C4).....	510	Nevada, (F3).....	869	Quinlan, (F3).....	910	Socorro, (A6).....	1,879	Waskom, (H3).....	850
McCauley, (D3).....	2,081	New Boston, (G3).....	869	Quitaque, (D2).....	1,600	Somerville, (F4).....	1,009	Water Valley, (D4).....	200
McDade, (F4).....	6,677	New Braunfels, (E5).....	3,590	Quitman, (G3).....	1,000	Sonora, (D4).....	800	Weatherford, (F3).....	6,203
McGregor, (F4).....	741	(E5).....		Ralls, (D3).....	1,600	Sourlake, (G4).....	3,032	Weesatche, (F5).....	200
McKinney, (F3).....	1,600	Newcastle, (E3).....	1,452	Ranger, (E3).....	16,205	South Groveton, (G4) 614		Weimar, (F5).....	1,171
McLean, (D2).....	1,079	Newport, (E3).....	294	Rankin, (D4).....	1,000	Southland, (D3).....	550	Wellington, (D2).....	1,968
Mabank, (F3).....	1,600	Newton, (H4).....	1,250	Ratcliff, (G4).....	310	Spearman, (D1).....	720	Weslaco, (E6).....	5,000
Madisonville, (G4) 1,079		New Ulm, (F5).....	600	Ravenna, (F3).....	412	Spofford, (D5).....	1,100	West, (F4).....	1,629
Madisonville, (G4) 1,079		New Ulm, (F5).....	600	Raymondville, (F6) 1,700		Spring, (G4).....	3,704	Westbrook, (D3).....	800
Magolia Park, (G5).....	4,080	New Waverly, (G4).....	600	Realitos, (E6).....	350	Springtown, (F3).....	1,300	West Columbia, (G5).....	1,900
Malakoff, (G3).....	1,300	New Willard, (G4).....	600	Refugio, (F5).....	170	Spur, (D3).....	810	Westhoff, (F5).....	600
Malone, (F4).....	488	Niles City, (F3).....	716	Refugio, (F5).....	933	Stamford, (E3).....	810	Westminster, (F3).....	631
Manning, (G4).....	700	Nixon, (F5).....	1,124	Rice, (F3).....	611	Stanton, (D3).....	450	West Point, (F5).....	210
Manor, (F4).....	827	Nocona, (F3).....	1,422	Richards, (G4).....	400	Star, (E4).....	1,100	Wharton, (F5).....	2,346
Mansfield, (F3).....	720	Nome, (G4).....	210	Richland Springs, (E4).....	650	Stephenville, (E3).....	478	Wheeler, (D2).....	900
Marathon, (C3).....	720	Nordheim, (F5).....	443	(E4).....		Sterling City, (D4).....	2,457	Whitedeer, (D2).....	1,100
Marble Falls, (E4).....	639	Normangee, (G4).....	662	Richmond, (G5).....	1,273	Stinnett, (D2).....	478	Whitesboro, (F3).....	1,810
Maria, (B6).....	3,553	North Pleasanton, (E5).....	364	Riesel, (F4).....	500	Stockdale, (F5).....	700	Whitewright, (F3).....	1,666
Margaret, (E2).....	280	North Uvalde, (E5).....	400	Ringgold, (E3).....	470	Stratford, (D1).....	558	Whitney, (F4).....	1,011
Marietta, (G3).....	410	North Zulch, (F4).....	600	Rio Grande, (E6).....	2,900	Strawn, (E3).....	750	Whitt, (F3).....	300
Marion, (E5).....	700	Norton, (D4).....	260	Rising Star, (E3).....	906	Streetsman, (F4).....	310	Wichita Falls, (E3) 40,079	
Marlin, (F4).....	4,310	Nursery, (F5).....	300	Riverside, (G4).....	400	Sudan, (C2).....	478	Wiergate, (H4).....	700
Marques, (F4).....	500	Oakhurst, (G4).....	1,100	Riviera, (F6).....	410	Sulphur Springs, (G3).....	5,558	Willis, (G4).....	850
Marshall, (G3).....	14,271	Oakwood, (G4).....	1,100	Roaring Springs, (D3) 700		Sunset, (F3).....	750	Willis Point, (G3).....	1,811
Mart, (F4).....	3,105	O'Brien, (E3).....	400	Robert Lee, (D4).....	650	Sweet Home, (F5).....	310	Wilson, (D3).....	250
Mason, (E4).....	1,500	Odell, (E2).....	400	Robstown, (F6).....	948	Sweetwater, (D3).....	4,307	Winchester, (F4).....	460
Matador, (D3).....	692	Odessa, (C4).....	1,200	Roby, (D3).....	635	Swenson, (D3).....	300	Windom, (G3).....	389
Matagorda, (G5).....	780	O'Donnell, (D3).....	1,800	Rochelle, (E4).....	570	Swift, (F6).....	500	Winfield, (G3).....	750
Mathis, (F5).....	990	Ogelsby, (F4).....	450	Rochester, (E3).....	690	Taft, (F6).....	1,100	Wingate, (D3).....	230
Maud, (G3).....	380	Oglesby, (F4).....	450	Rockdale, (F4).....	2,323	Tahoka, (D3).....	786	Wink, (C4).....	3,000
Maxwell, (F5).....	350	Olton, (E6).....	250	Rockland, (G4).....	230	Talco, (G3).....	500	Winnie, (G5).....	220
Maydel, (G4).....	417	Olney, (E3).....	1,164	Rockport, (F5).....	1,545	Talpa, (E4).....	510	Winnboro, (G3).....	2,184
Maydel, (G4).....	417	Olton, (C2).....	270	Rocksprings, (D4).....	890	Tarpley, (E5).....	200	Winona, (G3).....	800
Maydel, (G4).....	417	Omaha, (G3).....	492	Rockwall, (F3).....	1,388	Tatum, (G3).....	570	Winters, (E4).....	1,509
Maydel, (G4).....	417	Orange, (H4).....	9,212	Roganville, (H4).....	500	Taylor, (F4).....	5,965	Wolf City, (G3).....	1,859
Maydel, (G4).....	417	Oceola, (F3).....	210	Rogers, (F4).....	1,256	Teague, (F4).....	3,306	Woodboro, (F5).....	600
Maydel, (G4).....	417	Overtown, (G3).....	528	Roma, (E6).....	800	Tehuacana, (F4).....	614	Woodson, (E3).....	400
Maydel, (G4).....	417	Ozona, (D4).....	1,150	Ropesville, (C3).....	304	Tell, (D2).....	350	Woodville, (G4).....	1,000
Maydel, (G4).....	417	Paducah, (D3).....	1,357	Roscoe, (D3).....	1,079	Temple, (F4).....	11,033	Wortham, (F4).....	1,100
Maydel, (G4).....	417	Paige, (F4).....	400	Rosebud, (F4).....	1,516	Tenaha, (G4).....	577	Wylye, (F3).....	945
Maydel, (G4).....	417	Paint Rock, (E4).....	650	Rosenberg, (G5).....	1,279	Terrell, (F3).....	8,349	Yoakum, (F5).....	6,184
Maydel, (G4).....	417	Palacios, (F5).....	1,335	Rotan, (D3).....	1,000	Texarkana, (H3).....	11,480	Yorktown, (F5).....	1,723
Maydel, (G4).....	417	Palestine, (G4).....	11,039	Round Rock, (F4).....	900	Texas City, (G5).....	2,509	Ysaleta, (A6).....	1,400
Maydel, (G4).....	417	Palmers, (F3).....	748	Rowena, (E4).....	450	Texhoma, (D1).....	313	Zapata, (E6).....	700
Maydel, (G4).....	417	Palo Pinto, (E3).....	480	Roxton, (G3).....	1,100	Texline, (C1).....	762	Zephyr, (E4).....	500
Maydel, (G4).....	417	Pampa, (D2).....	987	Royce City, (F3).....	1,289	Thomaston, (F5).....	280		
Maydel, (G4).....	417	Panhandle, (D2).....	638	Ruidosa, (B7).....	300	Thornedale, (F4).....	1,150		
Maydel, (G4).....	417	Paradise, (F3).....	480	Rule, (E3).....	890	Thornton, (F4).....	733		
Maydel, (G4).....	417	Paris, (G3).....	4,040	Runge, (F5).....	1,070	Thrall, (F4).....	272		
Maydel, (G4).....	417	Park Place, (G5).....	430	Rusk, (G4).....	2,348				

an area seventy-five per cent cultivable, lying in a middle temperate climate, which is as large as Pennsylvania; a mountainous area west of the Pecos as large as West Virginia; a farming country equal to the areas of Ohio and Kentucky; an area in the Edwards Plateau, adapted to stock-raising and diversified crops, as large as Tennessee. And this estimate does not mention the great coal and oil fields.

The People. As Texas is one of the younger states, its population is not yet large enough fully to develop its wonderful resources. Having 4,663,228 inhabitants—fewer than live in the city of New York—at the census of 1920, it ranked fifth in population among the states of the Union; Texas has grown very rapidly since 1920, and the estimated population for 1928 was 5,487,000. The average density of the population was 17.8, which is just about half that of the United States as a whole. Although nearly thirty Indian tribes inhabited Texas when the Spanish first visited this region, to-day there are but 2,100 red men. There are more than 741,000 negroes in the state, constituting nearly fourteen per cent of the entire population. The foreign-born population number 7.7 per cent, of whom the Mexicans are most numerous, numbering 5.3 per cent of the entire population; there are many Germans and Czechoslovakians in the state. In the south and west of Texas, a large part of the labor on the farms and ranches is done by Mexicans.

Two-thirds of the population live in rural communities. The largest cities are Dallas, San Antonio, Houston, Forth Worth, and El Paso, each having over 100,000 inhabitants; Beaumont, Galveston, Waco, Wichita Falls, Amarillo, Austin, Port Arthur, and Laredo are other large cities.

The tremendous development of Texas within recent years has doubled the size of many cities.

The largest religious bodies are the Baptist and Methodist. The Roman Catholic, Disciples of Christ, Presbyterian, and Episcopalian denominations are also important.

Education. Texas has an excellent system of public schools, under the supervision of the board of education, consisting of the governor, comptroller, secretary of state, and the state superintendent of public instruction. County schools are administered by county boards and commissioners; city schools are regulated by municipal boards of education. The state normals are under a board of regents. In 1915 three assistant superintendents were appointed, an appropriation was made for the purpose of establishing departments of vocational training in the high schools, and education was made compulsory. An education commission, appointed in 1923, made an exhaustive survey and recommendations for needed improvements in the school system. In 1920 illiterates over ten years of age formed 8.3 per cent of the population. Since 1925, factories may not legally employ children under fifteen years of age.

Texas provides generously for the support of its schools, from both state and local sources, and has a larger permanent school fund than any other state in the Union. Separate schools are maintained for the white and negro pupils, but the Mexicans frequently attend the schools for the white children. There are numerous consolidated schools and several junior colleges.

Among the many prominent institutions of higher education are Austin College at Sherman; Simmons University at Abilene; Southwestern University at Georgetown; Texas Christian University at Fort Worth; Baylor University at Waco; Baylor College for Women at Belton; Texas Women's College at Fort Worth; Howard Payne College and Daniel Baker College at Brownwood; Trinity University at Waxahachie; Rice Institute, Houston, and Southern Methodist University, all at Dallas.

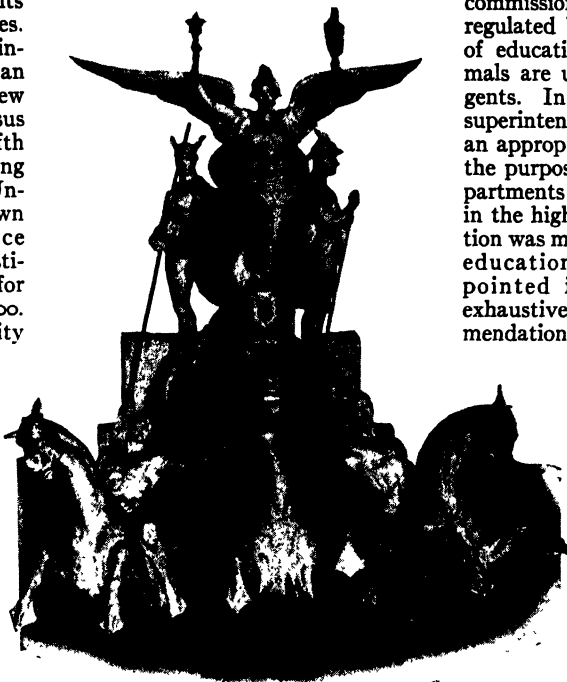


Photo: Wide World

A WAR MEMORIAL

Columbia leading the army and navy across the sea. Photograph of a model of a \$250,000 memorial of the World War for the University of Texas. Seven years were required for its completion.

Besides sharing in the maintenance of the elementary and high schools, the state maintains eight teachers' colleges, at Canyon, Huntsville, Denton, Alpine, Commerce, Nacogdoches, San Marcos, and Kingsville, and the following:

College of Industrial Arts, for women, at Denton.
Prairie View State Normal and Industrial College, at Prairie View, for negroes; coeducational.

Texas Technological College, at Lubbock; coeducational; opened in 1925.

Agricultural and Mechanical College, at College Station, opened in 1876, for men only, supplemented by coeducational branches in 1917.

North Texas Junior Agricultural College, at Arlington.

John Tarleton Agricultural and Mechanical College, at Stephenville.

University of Texas, at Austin, organized in 1883. The university is organized into the colleges or schools of arts and sciences, law, engineering, education, medicine, mining, and business administration, and an extension department. The department of medicine is located at Galveston, and in connection with it are the school of pharmacy and the John Sealey Hospital. The department of mines and metallurgy is at El Paso.

Charitable and Penal Institutions. Texas has been conspicuous among the Southern states in its provision for the scientific care of dependents and defectives. Provision is made for the care of crippled and deformed children at the Walter Colquitt Memorial Children's Hospital, and there is a home for neglected children at Waco. There are schools for the deaf, for the blind, and for the deaf, dumb, and blind colored youths, at Austin. Other state institutions of charity and correction are hospitals for the insane at Austin, Rusk, Wichita Falls, Terrell, and San Antonio; an orphans' home at Corsicana; an epileptic colony at Abilene; a hospital for the feeble-minded at Austin; a tuberculosis sanatorium at Carlsbad; homes for Confederate soldiers and Confederate women at Austin; a girls' training school at Gainesville; and a juvenile training school at Gatesville. All of these institutions are under the supervision of the state board of control. There is a penitentiary at Huntsville, and the state also maintains convicts farms in connection with its penal system.

Physical Characteristics and Resources

The Land. Texas consists of several vast plains sloping from the mountainous table-land in the northwest to the low, marshy shores of the Gulf of Mexico. The eastern and north-eastern section is an undulating timberland, continued from Arkansas and Louisiana, where there are dense forests of pine. The sandy soils of the section, where cleared, are adapted to diversified farming and fruit-growing. Experiments have shown remarkable returns of cotton to the acre, which may make this region a cotton-growing area.

Westward from the timbered belt are the great Black and Grand prairies of the north-central section, constituting the finest agricultural regions in the state. Toward the west these prairies become broken and rise to meet the Great Plains, a vast, treeless table-land, rising in a series of steppes from an elevation of 700 feet to the high plains at the New Mexico boundary line. This was formerly the great cattle country of Texas, a fertile land now giving way to the plow and the white bloom of cotton. The western part of this section, known as the *Llano Estacado*, or Staked Plain, extends into New Mexico. The northern part is known as the Panhandle plains, a high plateau traversed by the deep valley of the Canadian River. Once a region of endless ranges, the Panhandle, under cultivation, has proved the greatest wheat-producing area of Texas. It contains also one of the greatest oil-and-gas fields yet discovered.

Southwest Texas includes the Trans-Pecos area, where the elevated plains of gama grass

and buffalo grass are crossed by several spurs of the Rocky Mountains, locally known as "lost mountains," because they do not form continuous ranges. Among these lofty masses, crowned with dense forests, there are several peaks over 8,000 feet in altitude, the highest, Guadalupe Peak, reaching 9,000 feet. Except for growths of yucca and mesquite, the lower slopes of the mountains are bare of trees. This territory is still the home of the great cattle and sheep ranches. Mining is also important. Along the Pecos and Rio Grande rivers there are a number of great gorges cutting through the mountains, most noted of which is the Grand Canyon of the Rio Grande, over twelve miles long and 1,750 feet deep.

East of the Pecos is the Edwards Plateau, covered with growths of mesquite, bluebonnet, buffalo clover, and other native grasses, which support an extensive livestock industry. Besides cattle, there are great flocks of sheep and herds of Angora goats. Hundreds of square miles of this region are without railroad transportation, which has been a hindrance to development. Eastward the plateau gives way to a broken country of hills and streams, a region rich in minerals, and also a picturesque region to which thousands come in search of recreation.

The hill country merges southward into the fertile valley of the Rio Grande, and eastward to the coastal plains, a subtropical region where hardwoods and rice fields alternate along the streams. This is the heart of the Gulf-coast petroleum field, and of the export trade.

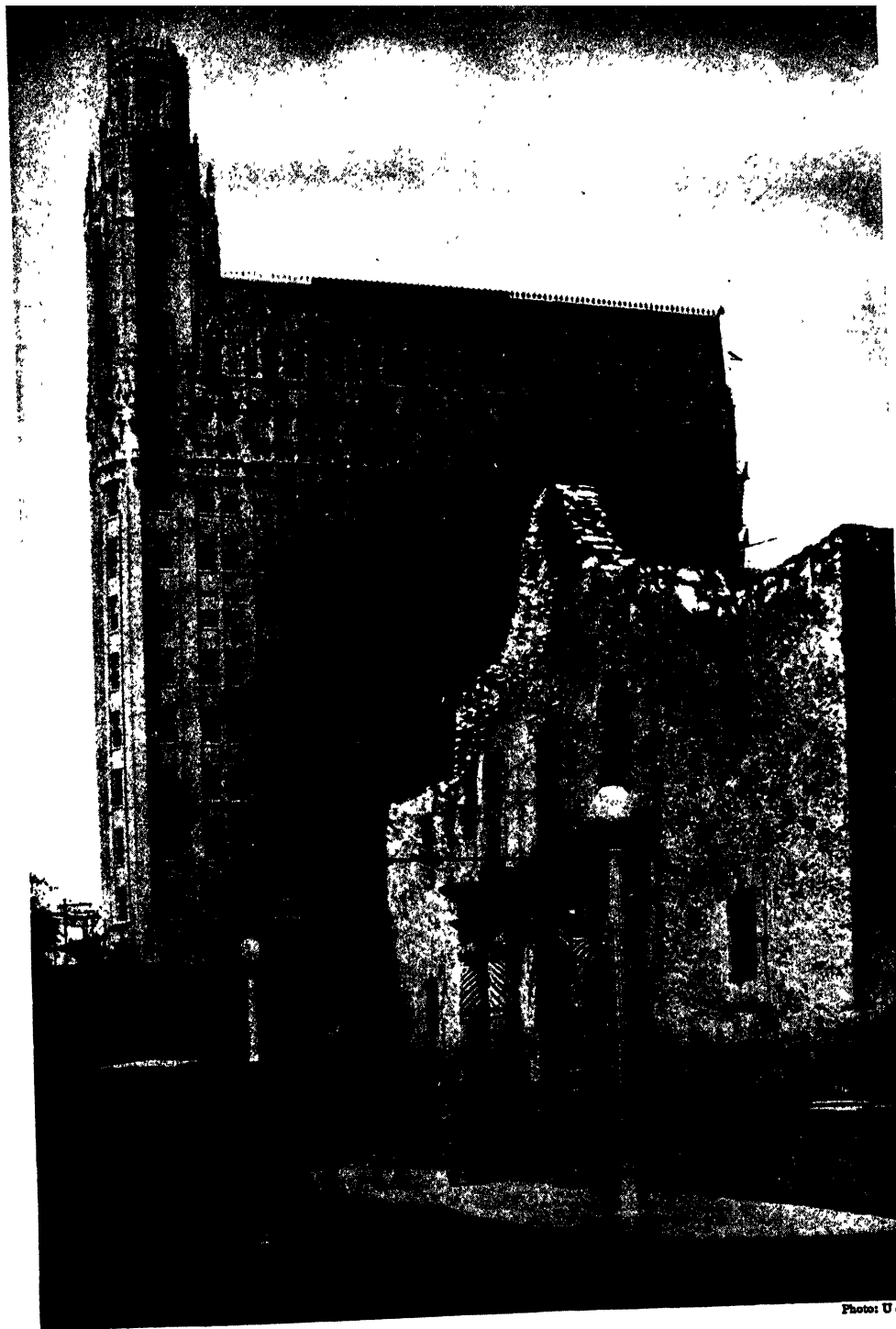
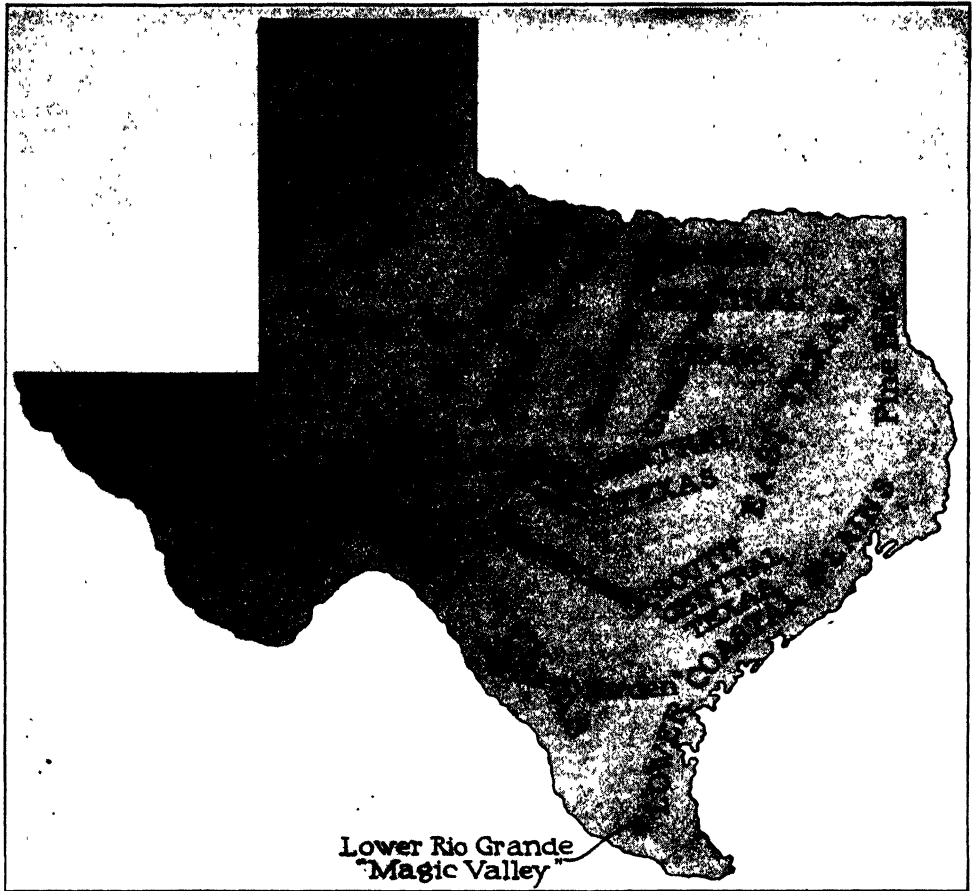


Photo: U /

Old and New Landmarks. In the city of San Antonio the modern Medical Arts Building stands close to the historic Alamo. See article ALAMO.

7121



REGIONAL MAP OF TEXAS

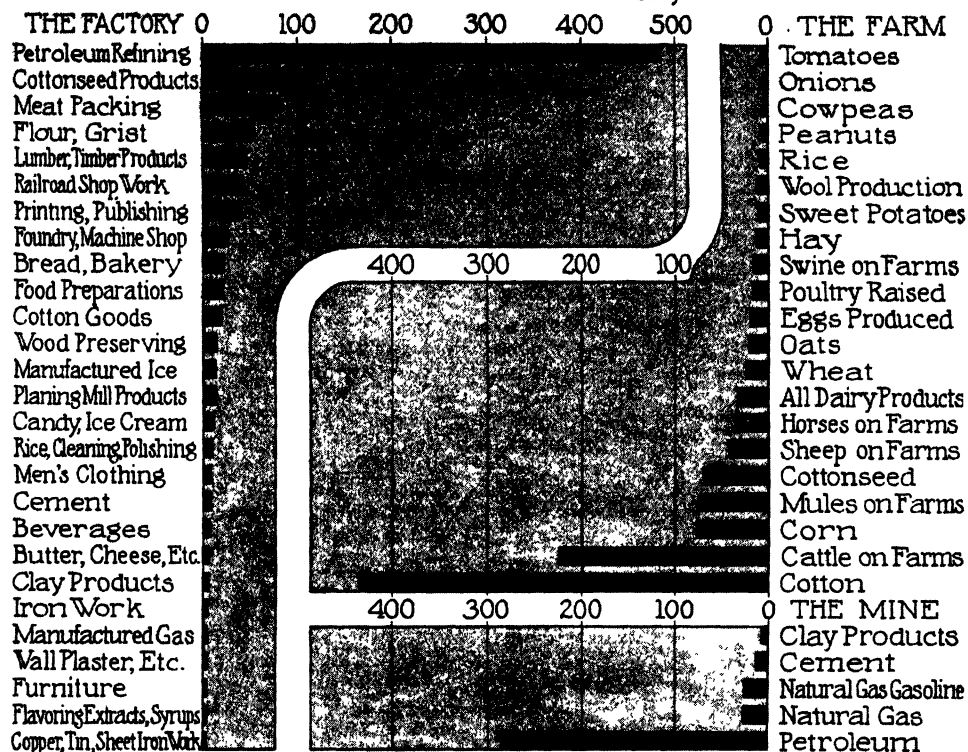
The entire Texas coast, facing the Gulf for a distance of 400 miles, is bordered by long sandbars, or by islands which enclose shallow coast lagoons. Padre Island, the largest of these bars, is 100 miles long, and is the most noted island of its kind in the world. Others are Galveston, on which the city of the same name is situated, Matagorda, Saint Joseph, and Mustang islands.

Rivers and Lakes. Water covers 3,498 square miles of the state's area. All of the forty-four rivers of the state except the Red and the Canadian, which empty into the Mississippi, belong to the Texas system, and all but the Rio Grande and its tributary, the Pecos, which rise in the mountains of Colorado and New Mexico, have their sources in the Texas table-land or plains. The rivers have a general southeast course, and empty into the Gulf of Mexico. In the west the streams are swift and clear, but near the coast they become sluggish and muddy, and their channels are often obstructed by sandbars.

The Rio Grande, for a length of 800 miles or more, forms the boundary between Texas and Mexico. In times of high water, it is navigable as far as Rio Grande City. Its principal tributary is the Pecos, which flows southeast across the western part of the state. The most important river is the Brazos, which flows for hundreds of miles through the richest and most developed section in the state, and is navigable for forty miles from the Gulf at all seasons of the year. The Red River, rising in the Great Plains, for a distance of 400 miles forms part of the northern boundary, and the eastern boundary with Louisiana is formed in part by the Sabine (called by the Mexicans *Sabinas*, meaning *cypress*), which flows south to the Gulf, through dismal, moss-hung cypress swamps. The Colorado, fed by the Concho, San Saba, Llano, and smaller streams, cuts its way through beautiful deep canyons and empties into Matagorda Bay. Other rivers of importance are the Neches, Guadalupe, Trinity, San Marcos, San Antonio, and Nueces.

TEXAS PRODUCTS CHART

Millions of Dollars Annually



Figures are from Federal and state sources, and represent averages for three years.

Texas has no large bodies of water, but there are many small, fresh-water lakes in the coastal plain, among which are Grand, Clear, and Sabine lakes. Caddo Lake lies on the Louisiana border, and salt ponds are found near the mouth of the Rio Grande, in the Llano Estacado, and the Trans-Pecos region.

Climate. Within the vast bounds of Texas the climate ranges from the moderately temperate to the subtropical. Along the southeast coast, the country is low and the climate warm; in the northeast it is low and damp, but cool; in the central and western regions, it is high, dry, and cool. As one leaves the coast and passes through the prairies and plains to the western mountains, the climate grows uniformly cooler, the temperature ranging from 73° on the Lower Rio Grande to 56° in the Panhandle, the northwest corner between New Mexico and Oklahoma. On the Llano Estacado, the air is so clear and dry that it is almost impossible to estimate distances; mirages are of frequent occurrence. The Gulf winds temper the heat of summer and modify the winter cold, and the mild, delightful winters of Southern

Texas have made that section a popular winter resort. During the winter months, occasionally there are disagreeable northwest winds called *northers*, accompanied by sleet and heavy rains. See *NORTHER*.

The rainfall is heaviest in the northeastern section, where it averages from thirty to fifty inches a year. The precipitation decreases toward the south and west, and in the extreme western part of the state, the annual average is about ten to twenty inches. Irrigation is necessary throughout the western and west-central sections. On the coast, the autumn months are wettest, but in the north, the spring is the rainy season.

Agriculture. The great fertile area of Texas makes it one of the most important agricultural states in the Union, even though its vast resources and possibilities are still far from their full development. There are in the state almost 168,000,000 acres of land, an area equaled in no other state; about 32,000,000 acres are in crops, although over sixty-five per cent of the total is in farm land. There is scarcely any known crop of the Temperate

Zone that cannot be raised somewhere within the boundaries of Texas.

The chief crop is cotton, which is most extensively grown in the coastal plain and central and northern prairies. The crop usually covers about 18,000,000 acres. Texas has for some years ranked first among the states in the production of cotton, furnishing one-third of the nation's supply, and about twenty per cent of the world's cotton.

The cultivation of rice has become an important industry along the coast, where the fields are flooded by water pumped from the lagoons and streams. The coastal regions in the fertile valleys of the lower Brazos, Trinity, Colorado, and Guadalupe rivers are among the finest sugar regions in the United States. Among the cereals, corn is the most important crop, chiefly in the black-land belt and North-Central Texas. Corn is not yet a commercial crop, being used chiefly for feed for work horses and swine. The state also produces large crops of sorghums (Texas ranks first in production and in number of varieties grown); wheat (particularly in the north and northwest); and oats, which furnish excellent winter grazing.

Truck gardening is important in Northeastern Texas, where large cities furnish markets. Large quantities of vegetables are shipped to Northern markets; the Rio Grande Valley furnishes watermelons for all the large markets of the Union; the tomato crop from this section is important commercially, as it comes in season between the Florida and California crops and those of the Northern states. Spinach is shipped north in large quantities, and the sweet potato is an important and valuable crop in East Texas. The fruit of Texas, especially the Elberta peach, is noted for its excellent quality. Apples, pears, plums, and grapes are also grown in orchards throughout the state, and in the coastal and sub-tropical regions are produced many oranges, grapefruit, and other citrus fruits; dates and figs are grown, the figs largely for canning and preserving. In the production of figs, and in nursery products, Texas is one of the leading states in the Union. Groves of pecan trees border the streams throughout almost the whole of Texas, except the Great Plains and Trans-Pecos areas. Many pecan trees which were flourishing when the Spaniards first came are still bearing. By grafting, the native pecan is being greatly improved.

Livestock. In 1540 Coronado introduced cattle into Texas, and sheep were brought in before 1680. While Texas was a republic, the cowboys began rounding up herds of wild cattle and driving them to New Orleans for sale. It was soon discovered that the prairie grass made excellent fodder, and it was inevitable that the great herds and cattle ranches of Texas should become famous. Over the long trails, north-

ward into Kansas, thousands of cattle were driven each year, until the railroads came and supplanted one of the picturesque and historic features of the Southwest. Homesteaders came, barbed wire was invented, the ranges were fenced in, and more attention was paid to the quality of the herd. Wars between the "nester" (the small farmer) and the cattleman, and between the Texas "longhorns" and the "shorthorns," marked the history of the state and of the cattle industry.

To-day, except in the southwestern area, the great ranches are disappearing, and the more intensive stock farms are appearing. Much of the livestock is slaughtered within the state.

During recent years, the sheep industry has doubled, until Texas is the leader in sheep and wool production. Sheep-raising is chiefly centered in the Edwards Plateau, which is also the principal area for goat-raising. Texas has about half of all the goats raised in the United States, and half of all the mohair produced is clipped in the Edwards Plateau district.

The turkey which graces your Thanksgiving table may have been raised in Texas, which produces about \$14,000,000 worth of turkeys annually. Poultry production is increasing rapidly; and the dairy industry should grow with the growth of larger cities for markets. Texas ranks second as a honey-producing state.

Irrigation. Under an irrigation law of 1913, Texas was divided into three water divisions, and a board of engineers was created to have charge of the water resources of the state. The arid region along the Upper Rio Grande is included in the Texas-New Mexico Federal reclamation project. About 800,000 acres are under irrigation, and the government projects include at least 2,000,000 more. An immense irrigation project was undertaken in 1927 in La Salle County, near Cotulla. The Lower Rio Grande River and artesian wells of the south and east-central region furnish water for a good many irrigation systems. The principal irrigated areas are the Rio Grande and Pecos valleys, sections of Western Texas, the coastal rice regions, and the region near Wichita Falls. Near El Paso, irrigation ditches have been found which were used by some race preceding the Indians; so irrigation is not new in Texas, although its chief development has been in recent years.

Forests. One of the chief sources of wealth is timber, which covers in all about half the state, principally in Eastern Texas, but following the streams and extending in belts among the plains. The yellow pine, which is the most important timber of the United States, is the principal lumber product. Hardwoods are found along the western edge of the dense pine forests which cover the northeastern part of



State
Flower

TEXAS



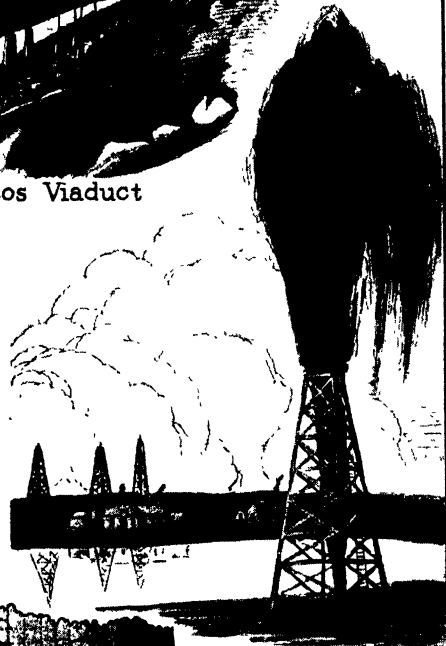
State
Seal



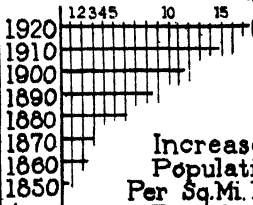
The Great Pecos Viaduct



In the Alamo Plaza



A Gushing Oil Well



Increase in
Population
Per Sq. Mi. by
Decades

Congressional
Districts



Religions

State University



the state; dark cypress swamps border the Trinity, Neches, and Sabine rivers, and groves of pecan, walnut, and other nut-bearers are also found along the eastern streams. The stunted blackjack of the east-central region, and the gnarled mesquite of the western plains, are used extensively for firewood. The lumbering industry is confined chiefly to the pine belt, and East Texas has hundreds of sawmills. In the value of timber products, Texas usually ranks seventh or eighth among the states. In 1915 the state provided for the appointment of a state forester and board of forestry, and in 1923 arranged for the purchase of forest reserves, now numbering 5,600 acres, and for coöperation with the Federal government in forest-fire protection.

Minerals. The mineral resources of the state, located largely in Central Texas and the Trans-Pecos region, are being developed rapidly, but the production still falls far short of the possible output. Texas usually ranks fourth among the states in total mineral production. There are extensive fields of bituminous and lignite coal in the north and east-central sections, and also a large field along the Rio Grande, between Laredo and Eagle Pass, covering, in all, about 85,000 square miles. There are beds of a very pure iron ore in the east and central mineral belts. In the mountainous region west of the Pecos River are gold, silver, quicksilver, copper, and lead mines.

One of the newest and the most important of the mineral industries is the production of petroleum. Oil was first discovered near Nacogdoches in 1866, but not until the discovery of the Corsicana, Powell, and Spindle-Top oil fields, about the beginning of the present century, did petroleum production assume its immense proportions. Texas, which had been outranked by only two states, California and Oklahoma, in the annual output of petroleum, achieved first place in 1928. Both illuminating oil and that used for fuel are produced. The Spindle-Top oil field, near Beaumont, is famous for its spouting wells, locally known as "gushers," which produce from 25,000 to 50,000 barrels a day. Closely associated with this industry is the production of natural gas and natural-gas gasoline; there are about 9,000 oil and gas wells. Practically all of the helium, a non-inflammable gas used in the dirigible aircraft of the United States, is produced at a government plant at Fort Worth.

The production of cement is probably next in importance. The state stands high in this product, and also in the output of asphalt, quicksilver, and sulphur; there are two great sulphur plants near the mouths of the Brazos and Colorado rivers, and since the exhaustion of the Louisiana sulphur deposit, Texas is practically the only producer of sulphur. Large

deposits of salt and a very pure gypsum are found in the north; an extensive field of cinnabar lies along the Rio Grande in the west; and clay and building stones are found in many counties. In 1928 announcement was made of the discovery of potash deposits which were rich enough to have commercial possibilities.

Texas has an abundant supply of artesian and mineral waters. The artesian belt, one of the largest in the world, embraces the central and north-central sections and the coastal plains; and many of the chief cities in the eastern part of the state, including Galveston, Houston, Dallas, and Waco, derive their water supply from it. There are also valuable mineral springs.

Fisheries. Oysters, clams, and shrimp abound in the shallow waters along the coast, and many varieties of fish are caught in the deeper waters of the Gulf. Constructive work has been done in recent years by the state game, fish, and oyster commission, including the establishment of several fish hatcheries for replenishing the waters, and the supervision of oyster culture, particularly in Matagorda Bay.

Manufactures. Although Texas is chiefly an agricultural and stock-raising state, the abundance of raw materials and the plentiful supply of cheap fuel from the local coal and oil fields make the state a logical site for manufacturing; as yet, the large manufacturing industries are in their infancy. The most important industries are oil-refining; the manufacture of cottonseed products; meat packing; and the milling of lumber and flour. Texas is second to Louisiana in the refining of sugar, making of molasses, and the cleaning and polishing of rice. Canning and preserving of fruits and vegetables; the manufacture of clay products and cement; and printing and publishing are widespread industries. Auto-assembling is a large industry, and there are many mills making brooms, paper, and textiles. The greatest field open to development is the manufacture of textiles, to utilize the great cotton crop of the state, instead of sending it out of Texas.

Transportation and Commerce. Truly a vast railroad system would be required to furnish adequate transportation in all parts of this state of magnificent distances. Although Texas has a greater railroad mileage than any other state in the Union, many of the southern coast counties and sections of the extreme west and northwest are still without railroad accommodations. There are, however, over a hundred railroads in the state, covering more than 16,000 miles, and the construction of new branches and spurs is steadily progressing. Two trunk lines cross from east to west en route to the Pacific coast, and two lines extending from the northeast to the south-



Photo: Visual Education Service

VICEROY'S PALACE IN SAN ANTONIO

Before the Mexican War, the building was the center of government under Mexican rule. Later it became the statehouse of the Texan republic. The structure was erected in 1749.

west corners of the state reach into Mexico. Facilities for transportation in the northeast and central parts of the state are excellent. The most important roads include the Southern Pacific Lines; the Frisco Lines; the Santa Fe system; the Missouri-Kansas-Texas; the Missouri Pacific; the Chicago, Burlington & Quincy; and the Texas & Pacific. The chief railway centers are El Paso, Houston, Galveston, Fort Worth, Dallas, Greenville, and Waco. There are about 1,000 miles of electric railway. Of the public roads, which cover about 180,000 miles, 20,000 miles are improved.

Galveston and Houston are rivals for title as the chief cotton-shipping port of the United States. Texas ports rank with New York and

New Orleans as the most important commercial ports of the country for the export of merchandise. Cotton, petroleum, lumber, rice, wheat, cattle, and sulphur are among the largest exports.

Undaunted by lack of natural ports, the state has made ports where they were needed. Houston, fifty miles inland, is a world port, jokingly called the "city that fooled the geographers." Port Arthur is another inland port made accessible by the determination of its people. A deep-water harbor was opened at Corpus Christi in 1926; and with the dredging of a deep-water channel across Laguna la Madre, in 1926, Point Isabel was expected to become an important port.

Government and History

Government. Texas is governed under the constitution of 1876, which is the fourth adopted since the admission of the state, the others being those of 1845, 1866, and 1869. An amendment may be proposed by two-thirds of the members of each house of the legislature, and it becomes effective if approved by a majority of the voters.

The *executive* power is vested in a governor, lieutenant-governor, secretary of state, comptroller, treasurer, attorney-general, commissioner of the general land office, three railroad commissioners, commissioner of agriculture, and superintendent of public instruction. The

secretary of state is appointed by the governor, but other state officials are elected by the people, for terms of two years. A surviving trace of the government of the Texan republic is seen in the extensive powers of the governor, who has, in addition to the usual privileges of the state executive, an extensive power of appointment, and the power of veto over the separate items in appropriation bills. A two-thirds vote in each house is necessary to pass over his veto.

The *legislative* department consists of a senate of thirty-one members, elected for four years, and a house of representatives whose

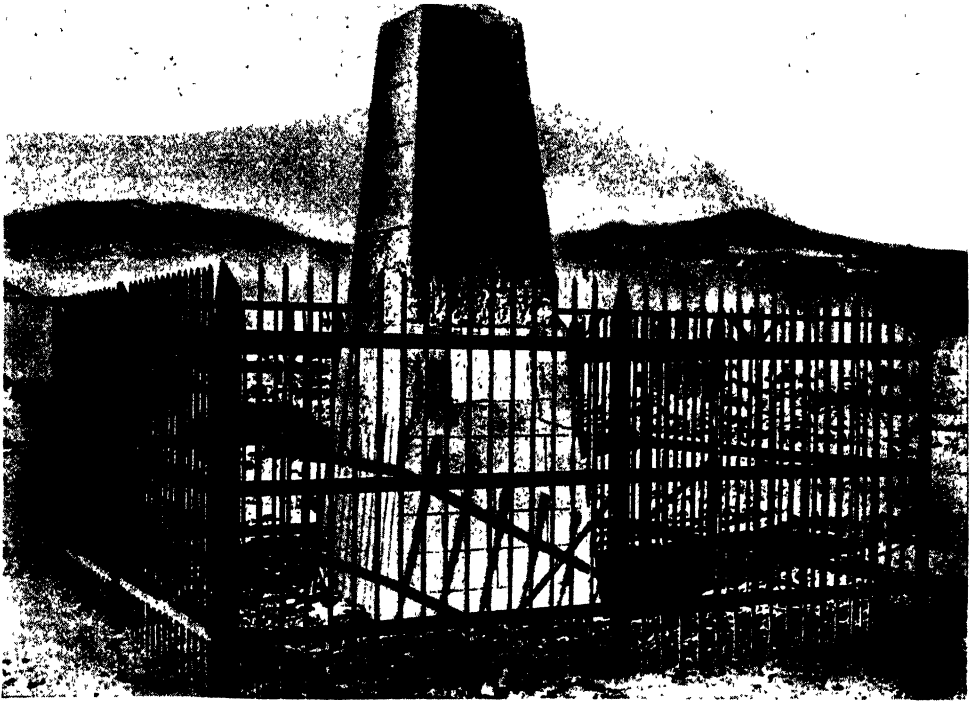


Photo: P & A

WHERE NEW MEXICO, TEXAS, AND OLD MEXICO MEET

Ten miles west of El Paso, where the Rio Grande ceases to be the boundary between Texas and Mexico, and at the extreme southeastern point of New Mexico, the U. S. government has erected a stone monument to mark the line between Mexico, New Mexico, and Texas. In walking around the iron fence, erected to protect the shaft from vandals, one enters both states and the Mexican republic. Owing to the disputes which have arisen in relation to the division of the territory, the Federal government decided to erect this permanent shaft; it is the only one which marks the junction of the two states with the Latin nation to the south.

membership cannot exceed 150. Representatives are elected for two years.

The *judicial* department consists of a supreme court, a court of criminal appeals, and courts of civil appeals, each having three judges elected for six years; district courts, having one judge elected for four years; county courts; commissioners' courts; and justices of the peace. In the judicial system there are many traces of the old Spanish government in Texas.

The county is the unit of local government. The commission form of government originated in Texas, and has been widely adopted in the state. In 1921 a constitutional amendment restricted the right to vote to natural-born or fully naturalized citizens, and permitted the legislature to legalize absentee voting. Atheists are excluded from all offices, and paupers, criminals, defectives, and persons who have fought duels are denied suffrage.

Exploration and Settlement. The history of Texas reflects the struggle between the Spanish, French, and English for the possession

of America. The first white man came in 1528, when Cabeza de Vaca and his companions were shipwrecked on the Texas coast. After crossing Southern Texas, De Vaca reached Mexico City. The earliest explorations were made by the Spanish, soon after the conquest of Mexico. In 1540 Coronado, in search of the famous Seven Golden Cities of Cibola, reached Ysleta, a Pueblo village on the Rio Grande. Two years later, a group of De Soto's men reached Texarkana, and in 1582 Espejo established a mission at El Paso. Upon these explorations, Spain based its claims to the region north of the Rio Grande. The French entered into the contest for the possession of the territory when La Salle, in 1685, founded a colony on the shores of Matagorda Bay, and, from 1712 to 1803, Texas was alternately under the control of France and Spain.

After the purchase of the Louisiana Territory from France, in 1803, the United States claimed the territory to the Rio Grande, but in 1819, in the agreement with Spain whereby Florida was acquired, the claim was abandoned,

QUESTIONS ON TEXAS

(An Outline suitable for Texas will be found with the article "State.")

Sketch a map of Texas, marking the physical divisions, forests, chief crops, and mineral regions.

What are the "lost mountains" of Texas? What reason can you see for their being so called?

How does the highest point in Texas compare in altitude with the highest point in each of the bordering states?

In what crop does Texas rank first among the states? What mineral?

List the crops as nearly as you can, in the order of importance; the minerals; the manufacturing industries.

How does the state compare with others in the extent of its artesian-well belt? What is the principle on which such a well operates? See ARTESIAN WELL.

Why did the admission of Texas to the Union bring on war between the United States and Mexico?

Compare the cotton production of Texas with that of the chief cotton-growing countries.

Where is the Llano Estacado, and what is one of its peculiarities?

What are "gushers," and where are they to be found?

How does Texas rank among the states in the output of petroleum?

What and where is the Alamo, and what part did it play in the history of Texas? See ALAMO.

Why is it a natural thing that every loyal Texan should revere the memory of Sam Houston?

How does the largest state in the Union compare in number of inhabitants with the largest city in the Union?

How does the area of the coal fields of this state compare with the total area of each of the five chief coal-producing states? See COAL.

What two famous explorers of early times reached the territory now comprised in Texas? For what was each searching?

What is the Panhandle of Texas? Describe its resources.

How many constitutions has Texas had? When was the present one adopted?

How does the largest state in the Union compare in size with the most populous? How do the two compare in population?

Which river of Texas is most important commercially, and which is most important historically?

How does the state rank in total railway mileage among the states of the Union?

What is the mileage to each hundred square miles of area?

What is the popular name of the state? Account for its origin.

How many rivers has Texas?

What does the name *Texas* mean, according to most authorities?

How does Texas compare in number of sheep and goats with the other states of the Union?

How is it possible that the United States may some time have more states, without enlarging its present boundaries?

What is the state flower? State tree? Why were they chosen?

Show how the diversity of crops, climate, forestation, physical characteristics, industries, etc., brings out the vastness of Texas.

What unusual powers enjoyed by the governor of Texas are traceable to its former status as a republic?

What was definitely settled by the Treaty of Guadalupe Hidalgo?

Can an atheist become a member of the legislature in Texas?

and the Sabine River was made the southern boundary of the United States.

Americanization and Struggle for Independence. In 1821 Mexico gained its independence from Spain, and Texas became a province of Mexico. The Americanization of Texas began in the following year, when Stephen F. Austin led a great immigration of United States citizens to Texas. By 1830 over 20,000 Americans had settled in the province, and Mexico, alarmed by their numbers, not only forbade further immigration, but began to discriminate against the American settlers. The Texans took up arms to defend themselves, and on March 2, 1836, the inhabitants of the province declared it a free and independent republic. On March 6 occurred the memorable Battle of the Alamo at San Antonio, where all of the Americans who had taken refuge in the old Spanish mission were killed. On April 21, 1836, Santa Anna, the Mexican President and general, was overwhelmingly defeated at San Jacinto by a small force of Texans under General Sam Houston. The independent government of Texas was then established, with General Houston as President.

Statehood. After a long controversy over the slavery question, Texas was formally admitted to the Union in December, 1845, on the conditions that the state should retain its unappropriated and vacant land; that new states not to exceed four in number might be formed within its boundaries; that the United States settle all questions of boundary with foreign countries. Mexico had not acknowledged the independence of Texas; consequently, its annexation brought on the war with Mexico, in 1846. By the Treaty of Guadalupe Hidalgo, February 2, 1848, the Rio Grande became the southern boundary. In spite of strong Union sentiment, Texas joined the Confederacy in the War of Secession. A new constitution abolishing slavery and renouncing states' rights was adopted in 1866, but it was not acceptable to Congress, and in 1867 Texas was placed under military government. Another constitution was adopted in 1869, and the following year the state was readmitted into the Union.

The growth and prosperity of the state have been remarkable, especially during the last twenty years. In 1900 thousands of lives were lost, and much of Galveston was destroyed, by a tidal wave, but the city has since been made safe by the elevation of its level, and by the construction of a great sea wall and a causeway between the island and the mainland. Disastrous river floods caused much loss of life and property in 1913. The public-warehouse system for the storage of cotton was established in 1914, to relieve the critical cotton situation. In 1915 resolutions were introduced in the legislature providing for the creation of a new

state, to be called "Jefferson," in the Panhandle, or northwest corner of Texas; or for division into three states—East, West, and Central Texas. No action followed. Though the state had previously refused to grant women the right to vote in general elections, the Federal amendment was promptly ratified.

For the term beginning in January, 1925, Texas elected a woman governor, Mrs. Miriam A. Ferguson, wife of the former governor, James E. Ferguson, who had been impeached and retired from office in 1917. She served but one term of two years.

An interesting recent event was the settlement of the long-standing boundary dispute between New Mexico and Texas, decided in favor of the latter, by which some 24,000 acres of land near El Paso remain with Texas. In 1928 Texas, for the first time in history, voted Republican in the Presidential election. The Democratic National Convention of 1928 was held in Houston. B.F.P.

Related Subjects. The reader who desires more detailed information with reference to Texas may consult the following articles in these volumes:

CITIES AND TOWNS

For cities and towns other than those listed below, see back of state map.

Beaumont	Galveston
Dallas	Houston
El Paso	San Antonio
Fort Worth	Waco

HISTORY

Alamo	Louisiana Purchase
Austin, Stephen F.	Mexican War
Guadalupe Hidalgo,	Tyler, John (Adminis-
Treaty of	tration)
Houston, Sam	

LEADING PRODUCTS

Corn	Petroleum
Cotton	Pine
Cottonseed Oil	Rice
Helium	Sheep
Lumber	Sorghum
Natural Gas	Sugar
Peach	

Brazos	Red
Canadian	Rio Grande
Colorado	Sabine
Pecos	

TEXAS FEVER TICK. See ZOÖLOGY (How Zoölogy Affects Human Welfare); **CATTLE TICK.**

TEXAS LONGHORN. See **CATTLE** (The Familiar Breeds).

TEXTILE, teks' til, a woven fabric, the name being derived from the Latin *textilis*, pertaining to weaving, and *textus*, a fabric. In general use, textile is an all-inclusive term for woven goods and articles made from them. These may be divided into a number of groups: cotton goods of all kinds; woolens, worsteds, and felt goods; silks and velvets; linens; fabrics of jute and other vegetable fibers; and those made from synthetic materials, like rayon, a

substitute for silk. The details of the processes by which all these varieties of textiles are made are given elsewhere.

Textile Industry. Most of these textile products have been manufactured for hundreds of years, but it is only since 1800 that the manufacture of textiles may be called a separate industry. Once it was customary for each household to produce most of the things it needed. The mother frequently spun the cotton or woolen yarn on her spinning wheel, wove it into cloth on a hand loom, and made the cloth into clothes. Later, in the household system, certain families and certain sections devoted their time to the making of cloth, all the work being done at home. These goods they sold at annual fairs, or to a middleman who traveled from house to house to make his purchases.

A further advance took place when a number of workmen assembled in a single building and worked for wages; this was the custom in English carding and fulling mills, long before the end of the eighteenth century. Between 1750 and 1800 came the inventions of Arkwright, Hargreaves, and others, destined to revolutionize the textile industry. This industry was the first to adopt the typical factory form of organization, which it has retained and developed to this day. It is a curious fact, however, that, in at least one branch of the textile industry, the household form has persisted, in spite of the growth of factories. In the manufacture of ready-made clothing, the sweatshop still has its place, although it is slowly disappearing.

Importance of the Industry. Textiles are made primarily for clothing, and have always been one of the leading classes of manufactures. In the United States, the value of the products of all the allied textile industries is exceeded only by that of foodstuffs; and in Great Britain and Ireland, the products of the textile industry are greater than those of any other group. In the United Kingdom, nearly 600,000 people are directly employed in the manufacture of textiles, and the number dependent, directly or indirectly, on the industry is seven or eight times as great. The textile industry of the United States employs nearly 2,000,000 people, chiefly in the five adjoining states of Pennsylvania, New Jersey, New York, Connecticut, and Massachusetts, and in North and South Carolina. The Canadian textile industry is growing rapidly, but still is small compared to that of the United States or Great Britain.

Textiles in the Schools. The study of textiles in schools is of a double character. The child, and particularly the girl, in the elementary and secondary schools, studies them chiefly from the viewpoint of the household arts or domestic economy. The technical

processes of textile manufacture, on the other hand, belong more especially to industrial education. As yet, the work in both branches has advanced little beyond the experimental stage. In many European countries, notably Great Britain and Ireland, Germany, Belgium, France, Norway, and Sweden, training in all household arts has for many years been a recognized feature of the school system. In the United States and Canada, the value of such training is being recognized everywhere, and courses are being instituted in many schools and colleges.

The study of textiles is a branch of social science—in other words, one of those subjects that are designed to make children better fitted for daily life. The study of primitive textiles involves some study of the beginnings of civilization, for the barbarian seldom knew how to weave. The textile arts are, then, to be considered in their relation to the broad questions of clothing and shelter, and such other practical points as modern methods of manufacture, varieties of textiles, their value for various purposes, and their prices. The adulteration of textiles is also an important point. The functions of textiles—that is, clothing—in health, beauty, and ethics is a phase of the subject too difficult for young children, but even in elementary schools, instruction in the care and repair of the wardrobe should be easily understood. Children in the higher grades, and in secondary schools, are capable of making many articles of clothing, and frequently of designing garments and household furnishings.

In the ordinary school course, textiles are studied from the standpoint of utility. To some extent, this viewpoint is preserved in technical education, but the emphasis is laid on methods of manufacture. In the United States, for example, there are a number of schools, supported partly by large textile manufacturers and partly by the state, which turn out each year hundreds of skilled workmen, familiar with the processes of manufacture and able to hold important positions in the mills. Noteworthy examples of such an institution are the Textile School at Philadelphia, and the schools at Fall River, New Bedford, and Lowell, three great cloth-making centers in Massachusetts. The Pratt Institute in Brooklyn (N. Y.) and the Lewis Institute in Chicago offer similar courses. In the South, textile courses are offered at the Agricultural and Mechanical College of Texas, the North Carolina State College of Agriculture and Engineering, Clemson Agricultural College, and Georgia School of Technology.

The more advanced work includes microscopic and chemical tests of the different fibers, dyeing and weaving, and pattern-designing, besides facts concerning the artistic and eco-

conomic aspects of the industry. Many schools also offer normal courses for teachers.

Related Subjects. Matter supplementary to this discussion of textiles may be found in these volumes, in the following articles:

Adulteration of	Crinoline	Poplin
Foodstuffs and	Damask	Rayon
Clothing	Dimity	Ribbon
Astrakhan	Felt	Satin
Broadcloth	Flannel	Shoddy
Calico	Flax	Silk
Cambric	Gauze	Taffeta
Canvas	Gingham	Tapestry
Chiffon	Hemp	Tartan
Cloth	Jute	Tweeds
Corduroy	Linen	Velvet
Cotton	Mohair	Weaving
Crape	Muslin	Wool
Cretonne	Plush	Worsted

THACKERAY, WILLIAM MAKEPEACE (1811-1863), one of the three most celebrated English novelists of the Victorian Age, the other two being Dickens and George Eliot. Thackeray was born July 18, 1811, in Calcutta, where his father was in the employ of the East India Company. He was sent, while still very young, to England to be educated. He spent several years at Charterhouse School, London, which he afterward described in *The Newcomes*, and passed a year at Cambridge, where Tennyson was a student at the same time. His well-known humorous verses on *Timbuctoo* were written on the topic assigned for the year's prize poem, but were not intended as a burlesque of Tennyson's poem, which won the prize. An interval of travel on the Continent followed, and then he settled down for a short time to study law.

From Art to Literature. In 1832 Thackeray came into possession of a considerable fortune, which was soon lost by the failure of an Indian bank and by unfortunate investments. From his boyhood days he had been fond of drawing, like his own Clive in *The Newcomes*, and he went to Paris to study art; but he was soon convinced that he would never be successful enough at it to earn his living, which he now found himself obliged to do. He began, therefore, in 1837, to write humorous tales and sketches, which were contributed, at first, to *Fraser's Magazine*, and to *Punch* from its establishment, in 1845, until 1851. Among the

collections of these writings are *The Yellow-plush Papers*, *The Irish Sketch-Book*, *Jeames's Diary*, and the *Snob Papers*.

Literary Development and Maturity. In 1836 Thackeray married Miss Isabella Shawe, who bore him three daughters, of whom one died in infancy. In 1840, however, Mrs. Thackeray's mind failed, and her husband was finally forced to abandon hope of her recovery, though she did not die until 1892. Meanwhile, his work had been growing in popularity, and with the appearance, in 1846-1848, of the serially published *Vanity Fair*, he became famous. In this novel, his intense hatred of sham and pretense is expressed in a satirical and wonderfully realistic picture of the life of the English upper class—a picture in which sordid desire for rank and wealth, and snobbish deference to the possessors of these prizes, are held up to ridicule and rebuke.

Not only casual readers, but also those who should see more deeply, have often called Thackeray cynical, but that he never was—he was too clear-sighted and too kindly. Indeed, his very ridicule of insincerity and vain show is praise for the opposite virtues. *Vanity Fair* was followed by *Pendennis*, which is in a measure autobiographical; *Henry Esmond*, a most faithful representation of English life in the early eighteenth century, by many reckoned his masterpiece and by some the greatest English historic novel; and *The Newcomes*, which by its pathos proves once and for all that Thackeray was no cynic. Colonel Newcome is one of the finest characters in all fiction.

In the year that *Henry Esmond* was published (1852), Thackeray gave further evidence of his keen insight into eighteenth-century life in his lectures on *The English Humorists of the Eighteenth Century*, delivered in the United States. In 1855 he made a second tour, lecturing on *The Four Georges*. These two series of lectures were published later, and are among the most delightful essays of the age. From 1859 to 1862, he was editor of the *Cornhill Magazine*, in which appeared his *Lovel the Widower*, *The Adventures of Philip*, *The Roundabout Papers* (a series of charming essays), and the first part of *Denis Duval*, which was left unfinished at the author's death. *The Virginians*, a sequel to *Henry Esmond*, published in 1857, is his only other really important novel.

His Place in Literature. It is the natural thing to compare Dickens and Thackeray, the two great humorous novelists of their age. Thackeray was a year older, but Dickens was the first to become popular, largely because of his energy and his self-confidence. Thackeray, on the other hand, was shy and sensitive all his life, and had always to drive himself to his work. The two were friends, without thought of jealousy; and by their pictures of English life, high and low, did an infinite service in making the England of their days live in the future.



Photo: Brown Bros.

WILLIAM MAKEPEACE
THACKERAY

Of himself he said, "I have no brains above my eyes; I describe what I see." He gave the world a true picture of the society of his day.



From Thackeray's "Vanity Fair." In a dramatic scene, Becky Sharp is forced to return gifts of jewelry to Lord Steyne. "It was all done before Rebecca could interpose. She stood there trembling before him. She admired her husband, strong, brave, and victorious."

Thackeray's style is remarkable for its ease and simplicity. As he says himself, he likes "occasionally to step down from the platform and talk about" his characters, and this familiar, colloquial manner is one of the chief charms of his writings.

THALER, *tah' lur*, a large silver coin current in North Germany from the sixteenth century until 1871, when the mark was first introduced. A few of these coins are still in circulation, and are equal in value to three marks, or 71.4 cents. The thaler was first coined in 1519, in the Bohemian town of Joachimsthal, from which it received the early name *Joachims-thaler*. See **MARK**.

THALES, *tha' leez* (640-546 B.C.), one of the Seven Sages of Ancient Greece and the founder of the earliest school of Greek philosophers, at Ionia in Asia Minor. He was a native of Miletus. He founded the geometry of lines, having learned the geometry of surfaces from the Egyptians, and was the first to apply that science to practical use in the measurement of the distance of ships at sea, the height of pyramids, etc. Much of his fame in his own day was the result of his accurate prediction of an eclipse of the sun, in 585 B.C. The philosophy of Thales was based on the theory that all things are composed of water, which, though false, was the origin of the later philosophies. See **PHILOSOPHY**; **SEVEN WISE MEN OF GREECE**.

THALIA, one of the three Graces, and one of the Muses. See **GRACES**, **THE THREE**; **MUSES**.

THALLI, *thal' i*. See **LICHENS**.

THALLIUM, *thal' ih um*, a metallic element resembling lead. It is one of the discoveries made by means of the spectroscope. In 1861 Sir William Crookes found in the spectrum a green line, which had never been identified. He named the new element thallium, from a Greek word meaning a *green twig*.

Thallium is found chiefly in crookesite, a mineral obtainable only in Sweden. There are traces of it in copper and iron pyrites, and from these it may be extracted by a somewhat involved process. All compounds of thallium are poisonous, the effects resembling those of lead poisoning. The chief uses of thallium are in connection with the making of optical glass, and in the manufacture of fireworks, to give a green color. The atomic weight of thallium is 204.3, and its symbol is *Tl*. See **CHEMISTRY** (**The Elements**).

THALLOPHYTES, *thal' o files*. See **ALGAE**.

THAMES, *temz*, **RIVER**, England's most important, though not its largest, waterway. Roman writers mention the *Tamesis*, and the name is probably a Celtic word, meaning *broad river*. It rises in the Cotswold Hills in Gloucester, in South-Central England, and flows in a generally eastward trend for 209 miles, expanding below London into an estuary

which widens to eighteen miles at its entrance into the North Sea. On its banks, above London, are Eton, Maidenhead, Oxford, Henley, Windsor, Hampton Court, Richmond, Kew, and many other places of interest, while below London Bridge, Greenwich, Woolwich, and Gravesend are the principal towns. The Thames is navigable for barges to within eighteen miles of its source, and it has been deepened below London Bridge until its docks are readily accessible to the largest vessels. The docks occupy thirty-five miles of the river banks. Though the Thames is crowded at its mouth with the busy commerce of a great empire, the upper reaches of the river are noted for their quiet, sylvan beauty.

At London Bridge the Thames is 250 yards wide, at Gravesend 700 yards, and at the Nore, between Sheerness and Shoeburyness, the estuary is $5\frac{1}{2}$ miles wide, increasing in width to the North Sea, eight miles below. From London Bridge to the sea at the Nore is $47\frac{3}{4}$ miles. The Victoria Embankment and the Albert Embankment, in London, below Westminster Bridge, on the left and right banks of the river, respectively, form broad roadways, protected by massive granite walls on the river side. See **LONDON**.

THAMES RIVER, **BATTLE OF**. See **WAR OF 1812**.

THANATOPSIS. See **AMERICAN LITERATURE** (**National Period**); **BRYANT**, **WILLIAM CULLEN**.

THANE, a title of Anglo-Saxon origin, meaning variously a servant, attendant, retainer, or official, but always with a military significance. In old England, there was a system of thanehood, quite similar to knighthood of later days; a freeman who was not of noble parentage might become a thane by acquiring a certain portion of land, by making three sea voyages, or by taking holy orders. He was then recognized as a member of the territorial nobility, and his sons inherited his thanehood.

The thane had a vote in the local and general Witenagemot (which see). A thane of ordinary standing was sometimes known as "lord of the manor," while a successful thane might hope to become an earl. The king's thane was a member of his bodyguard. He was therefore a personal attendant in war, and an important person, one who had many social privileges; he was, moreover, responsible only to the king for his deeds or behavior. On retiring from personal service to the king, he was given a grant of land. After the reign of Henry II, the thane disappeared from English history.

In Literature. The thane was an important figure in story and verse of olden time. Shakespeare causes Macbeth to say (*Macbeth*, Act 1, Scene 3), "I know I am Thane of Glamis"; the thaneship of Glamis was the ancient inheritance of the Macbeth family. Sir

Walter Scott, in his *Lay of the Last Minstrel*, makes the chief see—

... in the thanedom once his own,
His ashes indistinguished lie.

THANET, OCTAVE. See FRENCH, ALICE.

THANKSGIVING DAY, in the United States and Canada, a day set apart annually for the giving of thanks to God for the blessings of the year. Originally, it was a harvest thanksgiving, and while the purpose has become less specific, the festival still takes place late in the autumn, after the crops have been gathered. Indeed, it is probably an outgrowth of the harvest-home celebrations of England. Such celebrations are of very ancient origin, being nearly universal among primitive peoples.

The First Thanksgiving in the New World. Plymouth Colony's first dreadful winter, during which almost half of the Pilgrim company died, had passed, and renewed hope had grown up with the summer. When the corn crop was gathered, in the fall of 1621, Governor Bradford decreed a day of thanksgiving. Great were the preparations—the few women in the colony spent days boiling and baking and roasting; and even the children were busy turning the roasts on the spits before the open fires. As guests, there were more than four-score friendly Indians, who brought, as their share of the feast, wild turkeys and venison from the woods. The tables were set out of doors, and the company sat about them as one big family. This first Thanksgiving, however, was not merely a feast—there were prayers and sermons and songs of praise; and three days had gone by before the Indians returned to their forest and the colonists to their tasks.

Later History. From Plymouth the custom spread to the other colonies, until in time the governor of each issued an annual Thanks-

giving Day proclamation. During the Revolutionary War, eight special days of thanks were observed after signal victories or wonderful deliverances from danger, and President Washington issued a general proclamation for a day of thanks, in 1789. In the same year, the Protestant Episcopal Church in America announced the first Thursday in November as a regular annual day for giving thanks, "unless another day be appointed by the civil authorities." It was not until 1888, however, that the Roman Catholic Church formally recognized the day.

THANKSGIVING

For all that God in mercy
sends:
For health and strength,
for home and friends,
For comfort in the time of
need,
For every kindly word and
deed,
For happy thoughts and
pleasant talk,
For guidance in our daily
walk,
For all these things
Give thanks.



For beauty in this world of ours,
For verdant grass and lovely flowers,
For song of birds, for hum of bees,
For the refreshing summer breeze,
For hill and plain, for streams and wood,
For the great ocean's mighty flood,
For all these things Give thanks



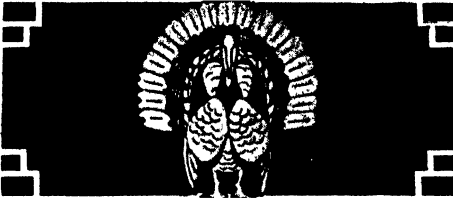
For the sweet sleep that comes with night,
For the returning morning's light,
For the bright sun which shines on high,
For stars that glitter in the sky,
For these and everything we see,
O Lord, our hearts we lift to thee,
And give thee hearty thanks.

... ELLEN ISABELLA TUPPER

appointed the last Thursday of November as Thanksgiving Day. It was thus Mrs. Hale won the title of "Mother of Thanksgiving."

Since 1864, the same day has been regularly set apart. The President annually makes a formal announcement, and the governors of the various states issue proclamations calling on the people to give thanks. The day is not a national legal holiday—the United States has no legal holidays, not even the Fourth of July—but almost every state has legalized it, by legislative act. Throughout the country, but especially in New England, where the custom originated, the day is looked upon with great reverence. It is peculiarly a family day, and the very sound of the name brings back inev-

For many years, there was no uniformity. Some states had an annual thanksgiving, others did not, and no proclamation was issued by the President. One woman, Mrs. Sarah Josepha Hale, the editor of *Godey's Lady's Book*, took an intense interest in the subject, and for twenty years sent out pleas through the columns of her journal for a nationwide thanksgiving. Nor did she stop at this. She wrote letters to each of the Presidents; and finally, in 1864, her efforts were rewarded, for President Lincoln



Suggested Program for Thanksgiving

The wee bird has its nest,
Safe in the tree so tall;
For birdlings' nest, for children's homes,
I thank the Lord for all.

Thanksgiving Hymn *Montgomery*
A Thanksgiving *Lucy Larcom*

Reading of the Thanksgiving
Proclamation

When the Frost Is on the Punkin. *Riley*
Essay, The First Thanksgiving
Thanksgiving Day . . . *Lydia M. Child*
Autumn Fires *Stevenson*
Essay, The Pilgrims' Journey to
America

What the Wood Fire Said to the
Little Boy *Frank L. Stanton*
The Pumpkin *Whittier*
Fable of the Ant and the Grass-
hopper

The Story of a Seed

Thanksgiving quotations

The Gift of Maize, from Hiwa-
tha's Fasting *Longfellow*

Tableaux

Puritans going to church
The Puritan (Deacon Chapin)
Priscilla and John Alden
A Thanksgiving dinner in old New
England

The visit of an Indian chief
Landing on Plymouth Rock
Song, *We Thank Thee*

itable memories of "back home"; of the old farmhouse kitchen, and the pantry crowded with "good things."

Thanksgiving Day in Canada. The Dominion, too, has an annual Thanksgiving Day, which is celebrated in much the same way, with family reunions and religious services. It is proclaimed by the Governor-General as a harvest festival, but, unlike that of the United States, it is not always set for the same day. Usually, it falls on the last Monday in October, but if harvest is especially early, an earlier day may be appointed. It is not strictly a legal holiday, being dependent solely on the government proclamation.

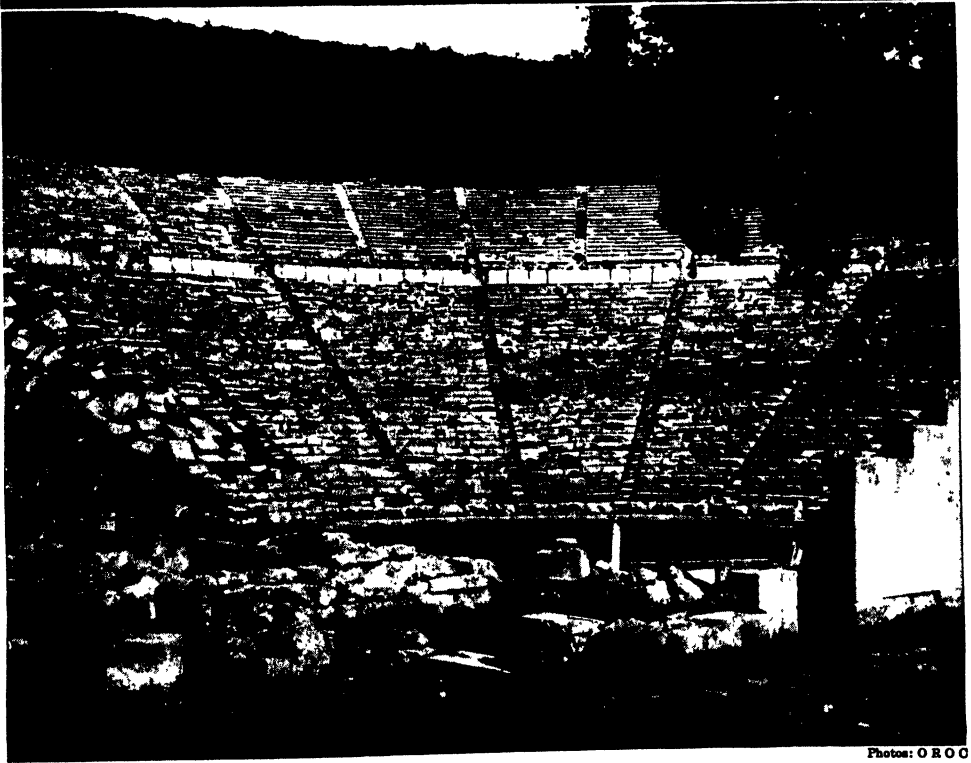
THAYENDANEGA, the Indian name of Joseph Brant (which see).

THEATER, a playhouse, or a building in which dramas and other spectacles are presented to public view. The modern theater consists mainly of two parts, the auditorium and the stage. The auditorium is for the accommodation of spectators, and includes entrances and exits, stairs, offices, and rooms necessary to the conduct of the theater and the convenience of patrons. The auditorium is usually of horseshoe shape, with the floor sloping slightly upward from the stage. Balconies are built in most theaters, and follow the horseshoe shape of the auditorium. Immediately in front of the stage, a place is provided for the orchestra.

The stage itself is reserved for the actors and the scenery, which, to meet the demands of modern audiences, must be extremely elaborate. Behind and at the sides of the stage, and sometimes above it, are the dressing rooms for the performers. To handle the scenery and shift it into the changing positions demanded during performances requires the employment of a large number of men, including stage carpenters and scene-shifters. Above the stage are the "flies," where the scenery is hung in pieces, ready to be lowered into position on the stage; and below it is another space of sufficient depth to allow the scenery or properties from the stage to be lowered into it, when necessary. A complete system of electric lighting for the whole theater is now controlled by one or two men, operating at a complicated switchboard at the side of the stage.

The law, as a rule, requires theaters to follow certain rules in building arrangements, to furnish a specified number of plainly marked exits, and to be provided with efficient fire-fighting apparatus. To prevent the spread of fire from stage to auditorium, every theater must have a fireproof curtain, made usually of steel or asbestos, covering the stage opening, or proscenium, and this must be lowered at least once during every performance, to show that it is in working order.





Photos: O R O O

Theaters of Ancient Greece. Above, the Theater of Dionysus, at Athens. Below, the best-preserved of the Grecian theaters, at Epidauros. The orchestra, for the musicians, is the circular ground area, 39½ feet in diameter. The highest row of seats is 193 feet from the orchestra, and 74 feet above it. The stage is in the foreground.

Tasteful decoration, comfortable seats affording a good view of the stage from any part of the house, excellent acoustics, and proper ventilation, with air-cooling apparatus for summer days, are usually found in the best modern theater buildings. For standard dramatic performances, the tendency is to reduce the size of the auditorium and to eliminate the old-fashioned gallery. A single balcony, rising gradually to the top of the auditorium, is the modern substitute for the two or more balconies of the old-time theater. On the other hand, theater buildings intended for moving pictures are becoming larger, and, in the most important cities, constantly more magnificent. The best moving-picture houses of to-day surpass in seating accommodations and elaborateness anything the modern theater world has ever seen. See MOVING PICTURES.

Ancient Theaters. The first theaters of Greece were rude affairs, built of scaffolding with raised seats, around a space in which the actors performed, or with the seats for spectators laid against a hillside. There was no curtain, but sometimes the stage was set off by low columns supporting an entablature; this pillared partition was called the *proskenion*, from which the modern word *proscenium* is derived. As the drama developed, so did the theater. The collapse of a theater in 499 B.C. led to the building of more permanent structures, though it was not until many years later that stone buildings were erected. The theater of Dionysus, in Athens, remains of which are still to be seen, was a work of the fourth century, and was completed under the direction of the statesman Lycurgus. The ruins of theaters which are to be seen throughout Greece are all greatly similar in form to the first theaters of Athens. Some of these were vast structures capable of accommodating from 10,000 to 40,000 spectators.

The Roman theaters closely resembled the Greek. The building was in the form of a semicircle, not covered by any roof. While the Greek semicircle was often cut out of the side of a hill, with the seats arranged in tiers up the slope, the Roman theaters were usually built on the level. The part which would now be called the auditorium was called the *cavea*. The back of the stage, generally a blank wall supposed to represent any building before which the action of the drama took place, and concealing the dressing rooms or tents of the actors, was called by the Greeks the *skene*, evidently the origin of the present-day word *scenery*. The space between the stage and the audience was then, as now, called the orchestra, and was devoted to the musicians by the Greeks, but in Roman theaters was occupied exclusively by the Senators.

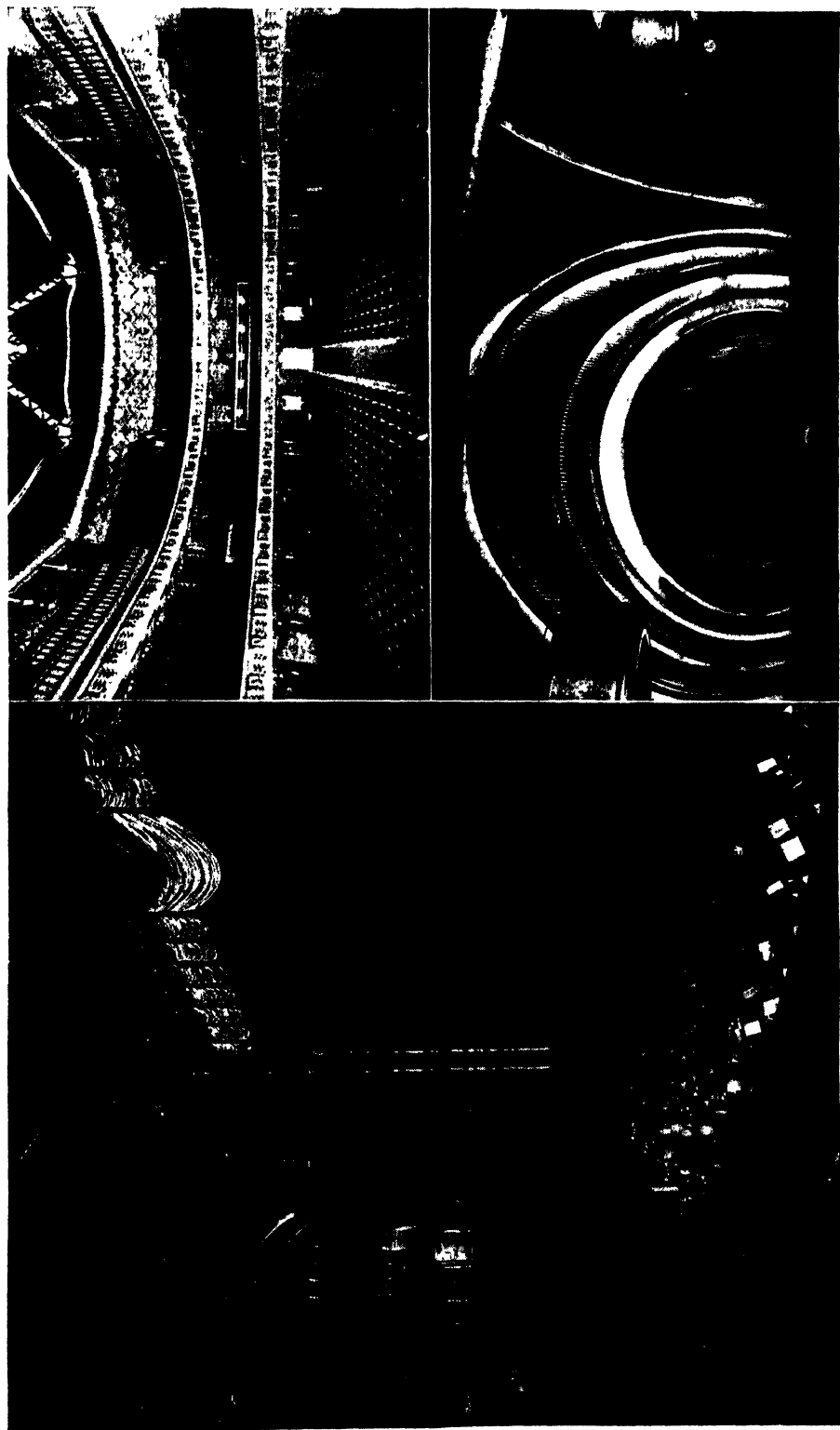
The immense size of the early theaters made it impossible for the actors to be heard by all

the audience. Metal mouthpieces, similar in principle to the megaphone, were sometimes worn. The actors were all males, the parts of women being taken by young men. It was not until 1622 that women appeared on the stage as actresses. See DRAMA.

The Theater in Shakespeare's Time. In the Elizabethan period of the drama, of which William Shakespeare, actor and playwright, was the bright particular star, there was a notable development in theater-building, as well as in the art of acting. This was due partly to the growth of a class of professional actors, who found the medieval type of play unworthy of their talents for the portrayal of character and of passion. The plays written for them therefore became more dramatic, and more interesting to the public. Companies of strolling players roamed the country, giving many of their performances in innyards. The English inn of that day was often a hollow square, with a central courtyard, surrounded by galleries; and there the strollers would hastily put up a platform, around which the country folk might stand, while the persons of quality could look down from the galleries. In London, the performances in places of public entertainment drew such crowds that the city authorities tried to suppress them; as a result, the players, formerly wanderers, were obliged to build theaters of their own, outside of the municipal limits, and to establish themselves permanently in such houses.

The first public theater thus established was built just outside of London in 1576, by James Burbadge, father of Richard Burbadge, an actor afterward associated with Shakespeare. The building was simply a hollow square, about eighty feet each way, open to the sky in the center, and consisting of little more than a quadrangle of galleries, which could be divided into private boxes for the accommodation of such persons as would pay for them. The whole ground floor was the yard or "pit," furnishing standing room for the mass of playgoers; and into this yard projected the stage, perhaps forty feet square. Where the rear gallery ran across the stage, a heavy tapestry curtain was hung, to shut off the space behind, which might be used as a dressing room. The rear gallery itself, just over the stage, was utilized as a balcony, a pulpit, the wall of a fortress, a roof, or any other elevation demanded by the action of the play. Certain favored spectators were allowed to sit on the stage, to the right and left, on stools, which might be hired. There was no curtain, and no scenery of any kind.

In 1598 the famous Globe Theater, in which Shakespeare produced many of his plays, was built by his friend Richard Burbadge, on the south bank of the Thames. In this building, also, there was no stage scenery, in the modern



Photos: U & U

The Modern Theater. At left, interior of the Roxy Theater, New York City; it is devoted to moving pictures and stage presentations. At right, above, interior of the Tushinsky Theater, Amsterdam, Holland, said to be the largest in the world; below, interior of the Titanic Theater, Berlin, Germany, with striking ovals surrounding the stage.

sense of the word, but the costuming of the plays was elaborate, and properties, such as furniture and booths, were freely used. Two towns or two widely separated houses might be indicated on the stage at once, by the simple expedient of hanging descriptive placards on two separate doors at the rear of the stage, under the usual balcony. Performances were given only by daylight, but a little later, in the Blackfriars Theater, on the other side of the Thames—one of the first theaters to be roofed in—plays were given by candlelight. Seats were more freely provided in this theater, and its performances were attended by many of "the nobility and gentry"; but it was not until after the Restoration, in 1660, that the London theaters were generally roofed over and furnished seats for the occupants of the "pit," which is still the name used in England for the lowest floor of a theater, and for which popular prices still prevail. Prices of admission to the theaters of Shakespeare's time ranged from one penny to one shilling.

American Theaters. One of the earliest theatrical performances in America was that of Addison's *Cato*, for which the stage was set in a warehouse in Philadelphia, in 1749. In the following year, *Richard III* was performed in New York, with a makeshift stage and auditorium, and for several years stage plays were given in colonial warehouses and other rude structures. The first permanent theater in America was built in Philadelphia in 1766, of brick and wood. Oil lamps without chimneys "lighted" the stage, and there, on April 24, 1767, the first American play, *The Prince of Parthia*, was presented. New York's first theater was opened late in the same year, but it was not until after the Revolution, in 1794, that the first really complete theater in the United States was opened—the Chestnut Street Theater in Philadelphia. Almost every town in North America now has its permanent playhouse.

THEBES, an ancient Greek city in Boeotia, head of the confederacy known as the Boeotian League, and at one time the supreme power in Greece. Thebes lay in the southeastern part of the country, about forty miles north of Athens and midway between Mount Helicon and the channel separating Boeotia and the island of Euboea. According to tradition, it was founded by Cadmus, and there is a cycle of legends associated with the city that is almost as famous as the one connected with Troy.

The authentic record of Theban history begins with a controversy between Thebes and Plataea, toward the close of the sixth century B.C. In 431 B.C., a Theban force made an attack on Plataea by night, an event that precipitated the long-threatening Peloponnesian War. Under the tyrannical rule of Sparta, the Boeotian League fell to pieces,

but between 379 and 374 B.C. it was revived by the patriotic efforts of Pelopidas, and in 371 B.C. the Thebans under Epaminondas wrested Grecian supremacy from the Spartans by the victory of Leuctra.

Theban supremacy came to an end with the death of Epaminondas, in 362 B.C., and in the period that followed, the exhausted and disunited Greek states came under the rule of Philip of Macedon and his ambitious son, Alexander the Great. A revolt against Alexander was punished by the destruction of the city, but it was rebuilt in 315 B.C., and was revived under the later Roman Empire. Thebes again became prosperous during the eleventh and twelfth centuries, as a center of the silk trade, but it declined under the Turks. In 1311 it was destroyed by the Catalans, and the site is now occupied by Thivai, an unimportant country town with a population of about 4,000.

Related Subjects. The reader is referred in these volumes to the following articles:

Alexander the Great	Greece (History)
Boeotia	Pindar
Cadmus	Sparta
Epaminondas	

THEBES. See EGYPT (Ancient Cities).

THEFT, IN CHILDHOOD. See MENTAL CONFLICT.

THEINE, the' in. See CAFFEINE.

THEMISTOCLES, *the mis' toh kleez* (about 514-449 B.C.), an Athenian statesman and soldier, one of the chief figures in the stirring times of the Persian wars. Little is known of his early life, but after the Battle of Marathon and the withdrawal of the Persians, in 490 B.C., he became prominent as the rival of Aristides and the advocate of naval expansion for Athens. In 482 B.C., he succeeded in having Aristides unjustly banished, and he persuaded the Athenians to build ships and fortify their harbors, feeling certain that, in case of renewed invasion by the Persians, the conflict would be decided on the sea.

At the time of the Persian expedition in 480 B.C., he was the chief man in Athens, and one of the most powerful statesmen in Greece. With patriotic surrender of his right as commander of the fleet, however, he consented to serve under the nominal leadership of the Spartan Eurybiades, though it was really Themistocles who brought matters to an issue favorable to Greece in the great Battle of Salamis (480 B.C.).

He was then more powerful than before, and did Athens good service by holding the Spartans in diplomatic parleys until the walls of Athens were practically rebuilt, contrary to the express demands of the Spartans. His arrogance, however, alienated the affections of the people, who began to credit rumors that he was not above treason if the bribes offered were large enough, and some time before 471 B.C., he was ostracized. After remaining

for a time in Argos, he fled to the Persian court, and was assigned by the king of Persia a residence in Magnesia, where he lived in luxury until his death.

According to some accounts, Themistocles committed suicide by taking poison. Though there remain against him suspicions of treason, he undoubtedly was in his day the savior of Greece, and by his naval policy laid the foundations for the future predominance of Athens.

Related Subjects. The following articles in these volumes give valuable supplementary information:

Aristides	Ostracism
Greece (The Period of Glory)	Persian Wars
Marathon	Salamis
	Sparta

THENARDITE. See GLAUBER'S SALT.

THEOBROMINE. See ALKALOIDS.

THEOCRACY, a form of government in which God is accepted as the Supreme Power, and the laws are received as the commandments of the Invisible Ruler. In such a government, the members of the priesthood act as interpreters and expounders of the laws, and have authority in both civil and religious matters. The most notable theocracy was that of the Israelites, to whom the Law was given by God, through Moses, the Ten Commandments forming the basis of the covenant. The Puritan government of Massachusetts was also styled a theocracy, as it was for many years conducted on the principle of obedience to divine law.

Derivation. The word *theocracy* is derived from the Greek *theos*, meaning *God*, and *kratos*, which means *power*.

THEOCRITUS, the *ok' rih tus*, a Greek poet, regarded as the creator of pastoral, or bucolic, poetry. He was born either at Syracuse or at Cos. The dates of his birth and death are not known, but he seems to have done his best literary work between 285 and 275 B.C. He traveled widely, was on intimate terms with high officials of Egypt and Syracuse, and apparently led a life notable for honors and gifts. Thirty idylls, or pastoral poems, bear his name, but it is highly probable that several of these were written by other poets. This type of poetry, which he seems to have founded in Greek literature, consists of fresh, vivid descriptions of rural life, and is somewhat in the form of a simple drama, with groups of musical shepherds alternately responding. The influence of Theocritus is seen in Vergil and in such modern poets as Tennyson, Swinburne, and Austin Dobson.

THEODOLITE, the *od' o lite*, an instrument for the measurement of horizontal and vertical angles, used in surveying. It consists of two graduated circles placed at right angles to each other, a telescope turning on axes mounted centrally to the circles, and a scale for each

circle, carrying two or more verniers (see **VERNIER**). Each circle is fitted with a spirit level, to enable the operator to know when the instrument is absolutely level. The whole instrument is mounted on a tripod, the legs of which are pointed with steel. Though still used considerably in England, the theodolite has been practically abandoned by American engineers in favor of the transit (which see). See, also, **SURVEYING**.

THEODORIC, the *od' o rik* (about 454-526), king of the Ostrogoths, commonly known as **THEODORIC THE GREAT**. He was born in Pan-



TOMB OF THEODORIC

Erected about the year 530 by order of Theodoric's daughter. It may yet be seen at Ravenna, Italy, and is now known as the Church of Santa Maria della Rotonda.

nonia, where his father, Theudemir, was joint ruler with his two brothers over the East Goths. When but seven years of age, he was sent as a hostage to Constantinople, where he lived for about ten years. In 474 his father died; he became chief ruler, and at once began to threaten the Greek Empire and even Constantinople. He accomplished nothing, but the emperor constantly feared him, and in 488 allowed him to proceed against Odoacer, in Italy. For over four years the contest continued, but in 493 Ravenna, where Odoacer had taken refuge, surrendered, and Theodoric's conquest of Italy was complete. The victor killed Odoacer with his own hands, despite the terms of the peace, and took the title of king of Italy.

From that time on, Theodoric abandoned war almost entirely, and devoted himself to improving his country; and Italy enjoyed under him a period of unexampled prosperity and

peace. Taxes were lightened, agriculture was promoted, and the good will of the original inhabitants of the land sought in every possible way. Theodoric himself was a follower of Arianism, but he showed the broadest tolerance of Christians until near the close of his reign, when he retaliated for Emperor Justin's persecutions of the Arians by imprisoning Pope John and permitting the execution of several leading members of the Church, including Boetius and Symmachus. Remorse for this deed is believed to have hastened his death. See **GOths** (The Ostrogoths).

THEODOSIUS I, *the o doh' shih us* (about 346-395), a Roman emperor, known as **THE GREAT**. He was born in Spain and was the son of Theodosius, a great general who served the emperor Valentinian I. He accompanied his father in his campaigns in Britain, and himself defeated the Sarmatians in 374; but in 376, when his father was put to death, he retired from service and lived quietly in Spain. In 378 Emperor Gratianus summoned Theodosius to become his colleague on the throne, being aware of his own inability to govern the vast Roman Empire alone, and gave him the Eastern provinces, including Thrace, Dacia, Macedonia, and Egypt. The Goths were seriously menacing the empire, and it was the especial duty of Theodosius to repel these invasions—a perilous task, but one which he performed successfully, gaining victories by his diplomacy, as well as by generalship.

In 383 Gratianus met his death at the instigation of a usurper, Maximus, who for five years ruled the Western Empire as colleague of Theodosius; but in 388 the latter overthrew Maximus and became sole ruler. He recognized the young Valentinian II, son of Gratianus, as ruler of the West, and undertook a successful campaign to avenge his death at the hands of Arbogast. A revolt in Thessalonica in 390 roused Theodosius' wrath, and he took a cruel vengeance. The people of Thessalonica were invited to attend an exhibition in the circus, and when 7,000 or more of them had gathered, the doors were closed and they were massacred by barbarian soldiers. As a punishment for this inhumanity, Ambrose, bishop of Milan, refused Theodosius communion for eight months, and brought him to repentance and public penance. Theodosius was zealous for the Christian faith, and ordered the destruction of all heathen temples throughout his dominions, but history records him as cruel and vindictive in his persecutions.

THEOLOGY, the science of religion, which includes the study of the world with reference to a Supreme Being; also a critical study of doctrines, religious works, church history and institutions, the sacred languages, and the psychology of religious experience. See **RELIGION**.

THEOREM. See **GEOMETRY** (Terms Used).

THEOSOPHY, *the os' o fie*, a system of philosophic and religious thought, based on claims of a special insight into the divine nature and the fundamental laws of the universe. Jakob Boehme (1575-1624), a German mystic, who was one of the early theosophists, claimed that he was enabled by a direct divine illumination to see the root of all mysteries. His conclusion was that the world is simply a manifestation of God, created to exhibit, in the end, the eternal victory of good over evil, of love over wrath. Other thinkers along the same lines were Schelling, Molitor, and Swedenborg (which see).

In recent years, the term theosophy has been widely accepted to represent the beliefs and teachings of the Theosophical Society. This society was founded in the United States in 1875 by Madame Blavatsky (which see) and others. In 1907 Mrs. Annie Besant succeeded to the presidency of the society, but a separate organization had been previously formed in America after the death of Madame Blavatsky, in 1891. Hindu and Buddhist thought and doctrines have been prominent in recent theosophical teaching, a characteristic feature of which is the belief in reincarnation, in accordance with the Hindu doctrine of Karma—that the spirit advances to its goal through a succession of earthly lives, and that the consequences of a man's actions in his present life are reaped by his successor on earth in a fresh incarnation.

THERAPEUTICS, *thehr ah pu' tiks*, the science of healing disease. It includes both curative and preventive measures, and may be considered under the following heads: *mental, dietetic, physical, pharmacal, serum and vaccine, surgical, and preventive*. Mental therapy is more or less fundamental to the highest success of any of the other branches. Diet also has a universal application. Physical therapeutics includes the use of heat, cold, water, light, electricity, massage, exercises, and adjustive therapy; surgical includes major and minor surgery and orthopedics; and preventive embraces the application of the principles of sanitation and hygiene. R.G.H.

Related Subjects. For a detailed discussion of the various phases of healing, see the articles listed at the close of the articles **MEDICINE AND DRUGS**; **DISEASE**; **HYGIENE**; and **SURGERY**.

THEREMIN, a trade name applied to a new and unique instrument which produces musical sound by exclusively electrical means. It appeared late in 1929, and was named for its inventor, Leon Theremin, a young Russian scientist.

The instrument has no keyboard, strings, reeds, or other mechanical aids or sources of sound. It employs radio tubes, with two metal

bars as antennae, and a loud speaker. One antenna, a straight, perpendicular bar, controls the tone, pitch, or "voice" of the theremin. The other antenna, a looped horizontal bar, controls volume, or intensity of sound.

When any object, such as the human hand, is brought into the sensitive electric field surrounding the vertical antenna, the field is so affected that audio-frequencies—that is, sounds—are produced. These are amplified through the loud speaker. As the hand approaches the antenna, the pitch of the sounds becomes higher; as the hand is withdrawn, the pitch becomes lower. The other antenna is also affected by the proximity of the hand; as the hand approaches it, the power of the theremin's voice is lessened; as it is withdrawn, the power is increased. Both decrease and increase of the volume of sound are by minute and delicate gradations.

Thus, playing the remarkable instrument described as above by its sponsors is simply a matter of waving one's hands in the air, which seems almost incredible. Its range is said to be about three octaves, but it may be adjusted practically for any three consecutive octaves in the scale; and it is claimed that, without any musical knowledge or training, anyone who can hum or whistle a tune can play the theremin.

THERESA, *te re' sah*, OR TERESA, SAINT (1515-1582), was a Spanish nun, a patron saint of Spain. She was born at Avila, in Old Castile, and studied in an Augustinian convent, where she was so stirred by the tales of the ancient martyrs that she determined to seek martyrdom for herself. In 1533 she entered a Carmelite convent, and though she frequently deprecated the lack of severity and asceticism in the discipline of the Carmelite Order, she made for many years no special attempt to introduce reforms. The reading of Saint Augustine's *Confessions*, however, combined with the death of her father and certain supernatural visitations, or trances, to waken in her an intense spirituality and belief in asceticism; and she began to feel that it was her duty to restore the Carmelite Order to its original rigidity of rule. With a few followers, therefore, she withdrew in 1562 and set up a new convent, where her ideas might be put into force. Opposition to her plan was strong, but the Pope sanctioned it, and finally the general of the Order invited her to introduce her reforms into other convents. She opened many new houses in Castile, and even beyond its boundaries, accomplishing wonders by her unaided efforts.

For years after her death at Alva, in 1582, several cities contended for her body, and since the power of working miracles was supposed to inhere in her bones, these were carried to various places. She was canonized

by Pope Gregory XV in 1622. Despite the visions, which those hostile to her in her own day laid to possession by evil spirits, but which succeeding generations interpreted as special signs of the divine favor, she was a woman of the utmost wholesomeness of mind and of much practical wisdom. She wrote an autobiography and several mystic treatises, and left a large number of interesting letters, all of which were published in 1587. These have been translated from the Spanish into Italian, French, Latin, and English.

THERMAE, *thur' me*. See BATHS AND BATHING.

THERMAL SPRINGS, OR HOT SPRINGS, springs whose waters are warmer than the surrounding air. A thermal spring with water at the boiling point, which spouts into the air at varying intervals, is called a *geyser*. There are also quiet springs which have boiling waters. At the other extreme is the pool at a high altitude, whose water is of a higher temperature than that of the surrounding region, but only a few degrees above freezing. It is in volcanic regions that springs having the highest temperature are found, and in such cases the water is heated by flowing over beds of uncooled lava, or by coming in contact with hot rocks. Hot springs in non-volcanic regions are probably caused by the circulation of water, at great depths in the earth, before it returns to the surface under pressure. Many mineral springs are hot springs. R.H.W.

Related Subjects. The reader is referred in these volumes to the following articles

Geyser	Mineral Waters	Spring
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THERMAL UNIT. See UNIT, subhead; CALORIE.

THERMIT, a mixture of aluminum powder and iron oxide, used in foundries for purifying iron and steel in the ladle, and also in welding heavy sections of metal by the process called *thermit welding* (see WELDING). This useful metallic compound, or rather a valuable method of igniting it, was discovered in 1895 by Doctor Hans Goldschmidt, of Essen, Germany. In 1897 he was granted an American patent for the use of aluminum as a reducing agent in the production of metals free from carbon, including cobalt, chromium, tungsten, and magnesium, by the aluminothermic process. When used in the foundry, the thermit, contained in a can at the end of a rod, is plunged to the bottom of the molten metal in a ladle. Intense heat is thereby generated, and this tends to liberate many impurities, which are carried away in the slag. Commercial thermit is produced in three varieties, known, respectively, as *plain* thermit, *railroad* thermit, and *cast-iron* thermit. Plain thermit is simply a mixture of aluminum and iron oxide, as noted above. Railroad thermit,

useful in repairing locomotive frames, propeller shafts, broken rudder frames, and similar heavy parts, is plain thermit with the addition of small percentages of nickel and manganese, and fifteen per cent of mild steel punchings. Cast-iron thermit is plain thermit with three per cent ferrosilicon and twenty per cent steel punchings added.

THERMODON, an ancient river in Asia Minor. See **AMAZONS**.

THERMODYNAMICS, *thur mo di nam' iks*, the science of the motive power of heat, or the application of the principles of mechanics to heat phenomena. See **HEAT**; **HEATING AND VENTILATION**.

THERMOELECTRICITY, *thur mo e lek tris' ih tih*, the electric current set up in a circuit of two or more unlike metals, or in a circuit of one metal, the different sections of which are in unlike physical states, when one of the points of contact is heated or cooled. As electrical energy may be transformed into heat and light, so heat and light may be changed into electrical energy. This may be shown by connecting an iron wire with a German-silver wire, and attaching the loose ends to a galvanometer. When the joined ends are heated or cooled, the needle will show a responsive movement. If bismuth and antimony be substituted for iron and German silver, the effect will be still more marked. Since their electromotive force is greater than that of any other two readily obtainable metals, antimony and bismuth are used in constructing the thermoelectric pile.

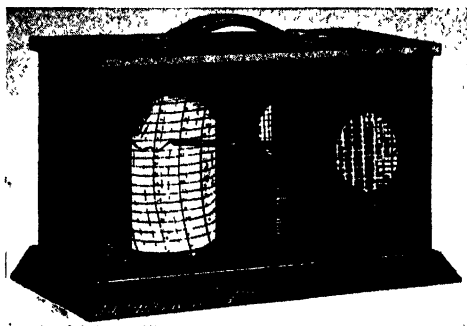
This pile, or battery, is constructed of alternate bars of antimony and bismuth soldered together, and is so sensitive to changes in temperature that it makes a very excellent substitute for a thermometer. As long as both faces have the same temperature, there is no current, but the slightest variation sets up a flow of electricity. This change may be almost infinitely small. There is, for example, enough heat in the body of a fly walking across one face of the pile to deflect the needle of the galvanometer. It is obvious that such an instrument is useful for detecting the most minute changes in temperature. This peculiar action of metals of different heat-conducting powers in starting electric currents was first observed by Johann T. Seebeck (1770-1831) in 1822.

H.S.E.

[See **ELECTRICITY**, and the various related subjects there named.]

THERMOGRAPH, *thur' mo graf*, an instrument which automatically makes a record of changes of temperature. A standard pattern, shown in the accompanying illustration, is provided with a spiral coil of metal which unwinds with a rise of temperature and winds up when cooled. These movements are recorded by a long needle carrying a pen, which traces a cor-

responding zigzag line on a revolving paper sheet moved by clockwork. Degrees of temperature are marked off on this sheet by vertical divisions, while hours of time are designated by horizontal distances. Usually, the



THE THERMOGRAPH

paper is prepared to receive the record of one week, and when the period is completed, the sheet is removed and a fresh one put in its place.

THERMOMETER, *thur mom' e tur*, an ingenious instrument for indicating temperature, one of the most useful applications of the law that bodies expand on heating and contract on cooling. There are various forms of thermometer, but the one in most common use consists of a glass tube, with a bulb of mercury or alcohol at the lower end. An increase in temperature causes the liquid to rise in the tube, and the point to which it rises is shown on a scale placed on or alongside the tube. As the substance in the tube has practically the same temperature as that of the surrounding air, the degree of temperature can be accurately read by noting the height to which the mercury or alcohol rises.

There are three standard scales—the Fahrenheit, Centigrade, and Reaumur—but only the first two are in general use. The Fahrenheit (abbreviated F.) scale has 180 divisions, extending between 212° and 32° above zero. These limits are, respectively, the boiling and freezing points of water. This scale is in general use for weather-temperature readings. A modification of this thermometer, called the *clinical thermometer*, has a very short column of mercury, and is used by physicians in taking body temperatures. On the Centigrade (C.) scale, the freezing point is marked 0°, and the boiling point 100°. This scale is used very generally in scientific calculations. The Reaumur scale has 0° for the freezing point and 80° for the boiling. It is not now in use.

Rules for Changing Scales. To change Centigrade readings into Fahrenheit, the number of degrees shown on the Centigrade scale must

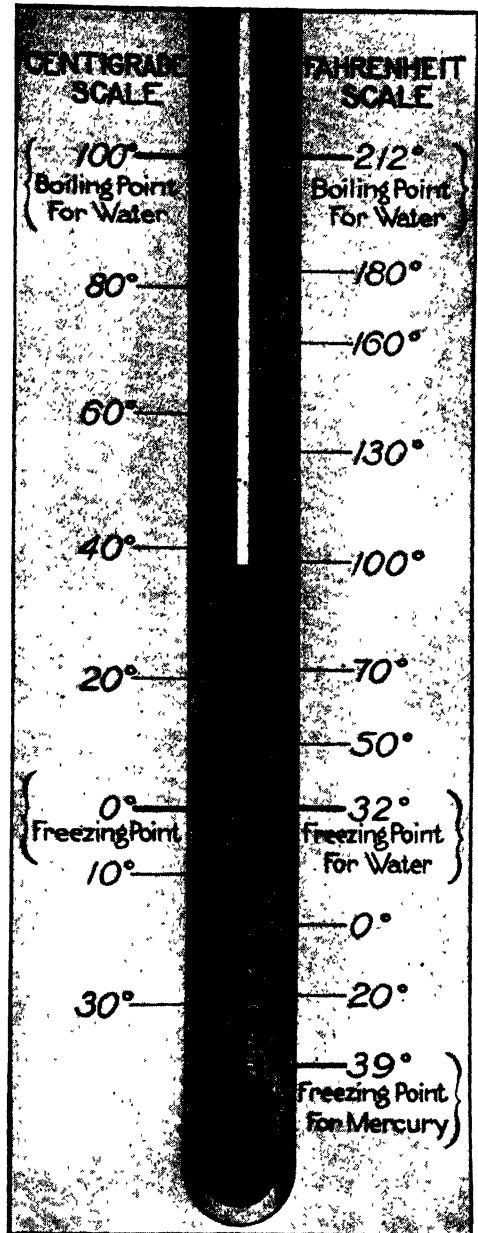
be multiplied by $\frac{180}{100}$, or $\frac{9}{5}$, and the product increased by 32. Thus, 50° Centigrade = $(50 \times \frac{9}{5}) + 32 = 122^{\circ}$ Fahrenheit.

To change Fahrenheit readings into Centigrade, subtract 32 from the F. reading, and multiply the remainder by $\frac{100}{180}$, or $\frac{5}{9}$. Thus, 140° Fahrenheit = $(140 - 32) \times \frac{5}{9} = 60^{\circ}$ Centigrade.

How a Thermometer Is Made. The glass tubes used for thermometers are constructed so that expansion and contraction will be equal throughout the length, and before being accepted, they are thoroughly tested. When a tube is found to be satisfactory, a bulb is blown at one end of it, and the opposite end is worked into a funnel shape. A little mercury is inserted through the funnel mouth, while the bulb is gently heated to expel the air. When the bulb is full and sufficient liquid extends above it, the funnel end is closed. The closed tube is then immersed in melted ice, the point to which the liquid in the bore drops is observed, and a marking made, thereafter known as the freezing point of water (0° C. or 32° F.). The instrument is then immersed in the steam above boiling water. Another mark is made at 212° F. or 100° C. The intervening space between the freezing point and the boiling point is subdivided according to the scale desired, and the thermometer is ready for use.

Historical. The principle of the thermometer was known before the year 1600. It was Galileo, the great astronomer, who improvised the first instrument for measuring the range of temperature; this was an open-air thermoscope, which he displayed in 1593. It was provided with a bulb on the end of a long, slender tube, which was marked with a scale; when the device was lowered into water, some of the air was expelled from the bulb and the liquid rose in the tube. It could register with only approximate correctness, because the scale lacked accuracy.

The term *thermoscope* remained in vogue until about 1625, when it was succeeded by *thermometer*. The first thermometer with a more accurate scale was probably an alcohol thermometer, made in 1641 by Ferdinand, Grand Duke of Tuscany. Twenty years later, this scale was improved by Fabri, the two pivotal points registering snow temperature and average midsummer heat. Between 1664 and 1694, the freezing and the boiling points of water were proposed as the fixed temperatures, but it was not until 1709 that Gabriel Daniel Fahrenheit, with an alcohol thermometer, and in 1714, with one of mercury, introduced the scale with which we are now familiar.



THE THERMOMETER

Showing gradings for both Fahrenheit and Centigrade scales. Comparison of the two scales is thus made easy.

The Reaumur scale, taking its name from its inventor, was introduced in 1731; in 1742 Celsius and Christin devised the Centigrade scale.

A.L.F.

Related Subjects. The reader is referred in these volumes to the following articles:

Centigrade	Galileo	Mercury
Fahrenheit	Heat (Expansion)	Temperature

THERMOPYLAE, *thur mop' ih le*, meaning, literally, *the hot gates*, is the name of a mountain pass of Greece. The mere mention of it is sufficient to stir in any hearer's mind thoughts of deeds of heroism, for it was here that Leonidas and his followers displayed their unexampled bravery. The pass, which leads from Thessaly into Locris, lies between Mount Oeta and the Maliac Gulf, and was anciently the only way by which an army might pass from Northern into Southern Greece. As it was a narrow track, about fifty feet wide, it was easily defended by a comparatively small force, and was thus one of the important strategic points in the country.

When, in August, 480 B.C., Xerxes with his vast hordes of Persians attempted the invasion of Greece, Leonidas, king of Sparta, went with 300 Spartans, 1,100 Thespians and Thebans, and allies from other Greek states, to the number of 3,500, to hold the pass of Thermopylae. For two days, the Persians tried in vain to force a way through, even the famous Immortals being turned back, but at evening of the second day, a treacherous Thessalian, Ephialtes by name, showed to Xerxes a path over the mountains, and the Persians were enabled to cross and fall upon the Greek rear. Dismissing, at the approach of the enemy, all his followers except the Spartans, Thespians, and Thebans, Leonidas prepared to fight to the death, and all fell except the Thebans, who surrendered.

Two hundred years later (279 B.C.), another invader, Brennus the Gaul, tried to enter Greece through the famous pass. He was held at bay there for several months, until a way was discovered over the mountains, but this time the Greek defenders managed to escape.

Some of the features of the ancient pass remain unchanged; the medicinal hot springs which gave it its name still bubble forth at the foot of the hill. The pass itself, however, no longer exists, for deposits of the river Sperchius have broadened it to a marshy plain, three miles wide at some places.

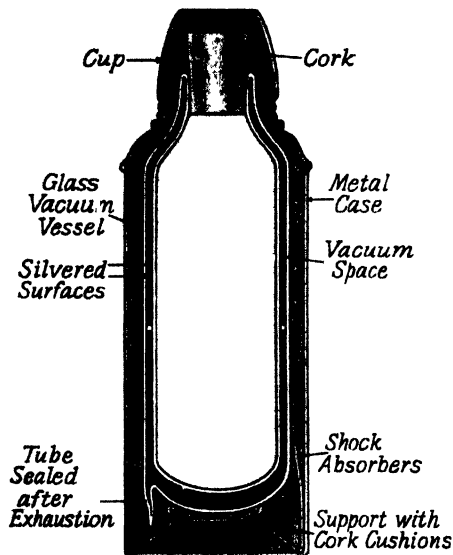
Related Subjects. In connection with this article, the reader may consult these topics:

Greece (The Period of Glory)	Persian Wars
Leonidas	Sparta
Persia	Xerxes

THERMOPYLAE OF AMERICA. See ALAMO.

THERMOS BOTTLE, a device for keeping substances either hot or cold. It is based on the principle that heat is transferred by the process of conduction, and that placing a non-conducting body next to a substance causes that substance to retain its heat or prevents outside heat from reaching it.

The thermos bottle consists usually of a double glass container enclosed in a metal case. The inner glass vessel, is fused to the outer after the air between them has been exhausted, and the vacuum thus created acts as a non-conductor (see VACUUM). Hot liquids poured into the container keep hot, because heat cannot flow out across the vacuum; and cold liquids remain cold, because outside heat cannot reach them. Heat is also kept out or in by having the inside wall of the thermos bottle silvered.



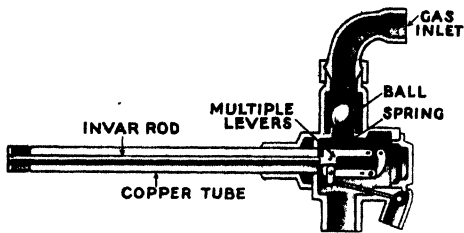
SECTIONAL VIEW OF THERMOS BOTTLE

This process creates a reflecting surface that turns back, or reflects, light rays that might convey heat out of or into the bottle. A cork closes the mouth of the bottle, and a screw cap seals the opening of the metal case. In the bottom of the case there is a spring or cushion upon which the container rests.

Theoretically, the contents of the bottle should remain hot or cold, as the case may be, indefinitely, but practically the limit of temperature stability is not more than twenty-four hours. Automobile tourists and picnickers find the thermos bottle a great convenience. Bottles of this type are manufactured under several trade-names, and in various sizes. One kind is made entirely of steel, which renders it unbreakable.

THERMOSTAT, a device for the automatic regulation of the temperature produced by a heating apparatus. It may also be used to maintain the temperature at a desired degree. Thermostats differ in details of construction, but all are designed to take advantage of heat

expansion, in controlling the source of heat. In some, the expanding medium is a volatile fluid; in others, a sensitive metallic element. The consumption of fuel and consequent production of heat are mechanically affected, in



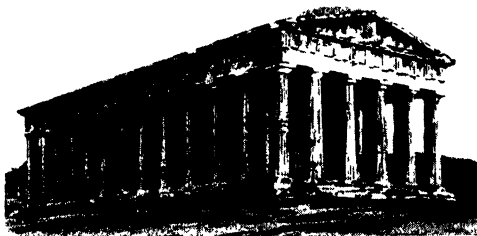
SIMPLE FORM OF THERMOSTAT

A popular design that is used on hot-water heaters. The invar rod (invar is an alloy scarcely susceptible to the influence of heat) is encased in a copper tube; the left extremity of the invar rod is anchored. The copper tube responds to falling temperature by contraction, which exerts a force on the invar rod. This gives action to the attached multiple levers, which increase the tension of the spring until it overcomes the weight of the ball, pushing it up and out of its seat, and permitting entrance of gas. The gas pours out of the burner holes, where a pilot light ignites it. [The burner is not shown here, as it has nothing to do with the action of the thermostat, which is shown complete.]

either case, by the expansion or contraction of the sensitive part with any change of temperature. See HEATING AND VENTILATION.

THERMOTICS, *thur mot' iks*, the study of heat. See PHYSICS; HEAT.

THESEUM, *the' se um*, among the Greeks, the name given to any temple erected in honor of Theseus (which see). A particularly cele-



THE THESEUM

brated one which existed in Athens in ancient times contained what was supposed to be the body of Theseus, and was ornamented with paintings and sculptures showing his deeds. No trace of it remains, and its exact site is uncertain. There still exists, however, a famous and beautiful structure which is called the Theseum, though it was probably a temple to Hephaestus (Vulcan). This, it is true, bears sculptures showing scenes from the life of Theseus, but it has an equal number from the life of Hercules. This temple, the best preserved in Greece, is of Pentelic marble, in the

Doric style, and stands at the foot of the Acropolis. The interior to-day bears little resemblance to that of a typical Greek temple, for it was changed many centuries ago, when the building was used as a Christian church. For location, see ATHENS.

THESEUS, *the' se us*, a famous legendary king of Athens, whose marvelous exploits formed themes for Grecian poets, and whose wise and benevolent rule established the original power of Athens. He was the son of Aegeus and Aethra. It is recorded that Theseus tried to seize Helen of Troy for his bride, when she was but a child. He was brought up in seclusion by his mother, until he became a man. Then he removed the heavy stone which his father had placed over the sword and sandals by which he was to recognize his son, took his legacy, and proceeded to Athens, having many adventures on the way. Arrived there, he found his father much under the influence of his wife Medea, who, when she saw Theseus, recognized him as heir of the king and tried to poison him. Upon the failure of her attempt, she fled in her dragon car to Media, never to return.

When Theseus learned of the terrible tribute Athens was compelled to pay to Minos, king of Crete, he volunteered to go as part of the sacrifice for that year, and, if possible, to kill the Minotaur, whose savage lust for human flesh had to be gratified. Aegeus pleaded in vain, and Theseus set out in a black-sailed vessel for Crete. He killed the Minotaur, with the aid of Ariadne, the king's daughter, and with her and his joyous companions set sail for Greece. As a punishment for his crime in deserting Ariadne, on the return home, Theseus was made to forget to change his vessel's sails from black to white, the agreed sign of the success of his expedition. In consequence, he suffered the loss of his father, who killed himself when, from the Acropolis at Athens, he sighted the black sail returning.

On his arrival at Athens, Theseus was proclaimed king, and entered at once on the beneficent policy which made the city great, and brought about the union of the various Attic communities into a single state. After years of prosperous rule, however, he became cruel and overbearing, and was driven by his people into exile on the island of Scyros, where he was killed. Too late they realized how great a man he had been; and they brought back his remains to the city and buried them in a beautiful temple, where the hero was worshiped as a god.

Related Subjects. The reader is referred in these volumes to the following articles:

Ariadne
Athens
Helen of Troy
Labyrinth

Minos
Minotaur
Phaedra
Theseum

THESPIIS, a Greek poet who is generally considered the inventor, or father, of tragedy. He lived in Attica in the sixth century B.C. Thespiis introduced in the old choruses an actor who replied to the leader of the chorus, thus laying a foundation for the spoken drama; and was himself both actor and manager, according to some authorities—transporting his properties on a cart from place to place, training local choruses, and giving public performances when they were ready. From Thespiis, we derive the term *Thespian art* for the art of acting, and the name *Thespians* for actors in general. See **DRAMA**.

THESSALONIANS, *thes ah lo' nih anz*, **EPISTLES TO THE**, two New Testament epistles written by Paul from Corinth, early in the year 50 A.D., to the Church in Thessalonica, in Greece, which he had recently organized. The first was written for consolation and encouragement at a time when the Church was suffering persecution from the Jews; and the second to correct the disorder that resulted from an exaggerated belief in the early coming of Christ. They are the earliest letters of Paul extant, and may be regarded as the beginning of Christian literature. See **PAUL**.

THESSALY, a district in Northern Greece, in ancient times the largest of the historic divisions of that country. It is an extensive

from Epirus; the coast range of Ossa and Pelion, on the east, shuts it off from the Aegean Sea. Mount Olympus, the fabled abode of the gods, rises on the northeast to a height of nearly 10,000 feet. The plain of Thessaly is drained by the Salambria River (the ancient Peneus), which finds an outlet to the sea in the northeast through the beautiful Vale of Tempe, between Ossa and Olympus.

Among the various sections into which Thessaly is geographically divided, the region to the southeast, on the Pegasæan Gulf (the modern Gulf of Volo), is of special interest, because of its association with ancient myth. From there Jason led the Argonauts in quest of the Golden Fleece, and it was the birthplace of the great Achilles. Near the modern Volo is the site of Iolcus, around which cluster many legendary tales.

The fertility of the soil of Thessaly was a powerful incentive to invasion by tribes from beyond the mountains, and during the period between the heroic and the historic eras, this region was the object of various migrations.

Only occasionally did the Thessalians enter actively into the affairs of Greece as a whole. In the fourth century B.C., however, united under Jason, the able tyrant of Phærae, they began seriously to threaten the rest of Greece, and were checked only by the assassination of their leader. Thessaly passed under the control of Macedonia in 352 B.C., through the conquest of Philip of Macedon, and was subject to that country until the Roman Flaminius, by the victory of Cynoscephalæ, in 197 B.C., made Macedonia a dependency of Rome. Thessaly remained a Roman province until the fall of the Eastern Empire, after which it was dominated successively by the Venetians and the Turks. During the Greek war for liberation, which ended in 1827, the southern part was freed from Turkish rule, and the greater part of the region was united with Greece in 1881, through the intervention of the Great Powers.

At the present time, Thessaly comprises the nomes, or departments, of Phthiotis, Larissa, Karditsa, Trikkala, and Magnesia. The great majority of the inhabitants are Greek. Volo, the one important port, maintains daily steamboat communication with Athens. A railroad connects Volo with Larissa, on the Salambria, and several other lines are distributed throughout the region. The people of Thessaly are occupied mainly in agricultural and pastoral tasks.

Related Subjects. The reader is referred in these volumes to the following articles:

Greece Jason Olympus Philip II

THETIS, mother of Achilles, and connected with the incident of the "apple of discord." See **ERIS**; **TROY**; **MYTHOLOGY**; **ACHILLES**.



LOCATION MAP

Thessaly is the black area. (a) Epirus; (b) Aetolia; (c) Locris; (d) Phocis; (e) Boeotia.

plain, enclosed on all sides by mountains that form an irregular square, each side of which is about sixty miles in extent. On the north side is the Cambunian range; on the south, Mount Othrys; the majestic Pindus chain forms the western boundary and separates the country

THIERS, *tyair*, LOUIS ADOLPHE (1797-1877), a French statesman, historian, and President of the republic, who proved his ability and patriotism in one of the most trying periods in the history of his country, at the conclusion of the Franco-German War. He was born in Marseilles and educated for the law; but, finding a literary and journalistic career much more to his liking, in 1818 he went to Paris to write for the *Constitutionnel*. His liberal tendencies led him to undertake a *History of the French Revolution* in ten volumes, the last of which was published in 1827. This became extremely popular, despite the fact that, like all of Thiers' work, it was open to the charge of inaccuracy and unfairness. The *National*, a paper established by him in 1830 as an opposition organ, had much to do with the Revolution of 1830, which placed Louis Philippe on the throne.

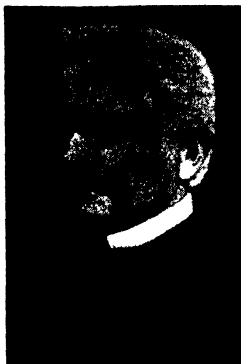


Photo: Brown Bros.

LOUIS ADOLPHE THIERS

The first President of the present republic of France.

Under the new monarchy, Thiers became a member of the Chamber of Deputies, and between 1832 and 1836 held various offices in the Ministry, much of the time being virtually Prime Minister. He resigned in 1836 when Foreign Minister, but in 1840 again became President of the Council and Foreign Minister, only to be driven from office by the king's attitude toward his policy of favoring Mehemet Ali, in his conflict with Turkey. When the Revolution of 1848 broke out, Thiers supported it, and favored the establishment of a republic. Louis Napoleon suspected him, and had him banished in 1851, but permitted him to return the next year. During the next ten years, he worked on his *History of the Consulate and the Empire*. He reentered political life in 1863, as Deputy for a division of Paris.

His speeches in the Chamber of Deputies constantly called attention to the unenviable position of France among the nations, and so did much to bring on the Franco-German War; though he opposed that struggle, throughout it he labored zealously to gain aid for his country from the other European powers. With the defeat of France, his opportunity came. He was made "chief of the executive power" in the provisional government, and brought about peace with Germany. With great vigor, too, he put down the revolt of the Commune in Paris, and in August, 1871, for his services he was declared President of the

republic for three years. The indomitable spirit and will which had enabled Thiers to help his country in its extremity had made personal enemies, and by 1873 the opposition had become so pronounced that he resigned. From 1876 until his death, he was an influential member of the Chamber of Deputies.

Related Subjects. See, in this connection, **FRANCO-GERMAN WAR**; also **FRANCE**, subtitle *History*, relating to the period; **GERMANY**, subtitle *History*, descriptive of the period of the war of 1870-1871.

THIMONIER, BARTHÉLEMY. See **SEWING MACHINE**.

THIRD DEGREE, originally a slang term employed by American newspapers, is now commonly used in the United States, and to some extent in Great Britain and Canada, to designate the use of harsh or brutal methods by police or other civil authorities, for the purpose of compelling prisoners or others to make confessions or divulge information. The methods of the third degree may include the use of physical violence and various forms of torture, such as depriving a prisoner of sleep, food, or drink, and subjecting him to prolonged questioning when he is exhausted by such treatment. Forms of physical assault, such as beating with a rubber hose, are, however, most commonly described by the term. In all such cases of official brutality, when proved, judges condemn the practice, and their objects fail, for juries are invariably inclined to free defendants whose confessions have been obtained by force.

THIRD-DEGREE MURDER. See **MURDER**.

THIRD ESTATE. See **STATES-GENERAL**.

THIRD INTERNATIONAL. See **INTERNATIONAL, THE**.

THIRD-RAIL SYSTEM. See **ELECTRIC RAILWAY**.

THIRD REPUBLIC. See **FRANCE**.

THIRST, that sensation by which the body announces its need of water. It is one of the *general*, or *internal*, sensations, as distinguished from the *special* or *exterior* (see **SENSES**, **SPECIAL**), and is thus in the same group as hunger, pain, and fatigue. The first sensations of thirst are referred to the mouth and throat, which feel dry. Moistening these parts without any actual ingestion of water will cause a disappearance of the sensation, while a local drying of these parts, even if the body itself be supplied with water, will produce the sensation. The pharynx, then, is considered an end-organ for the sensation of thirst, and it is here that the sensation is first recognized as satisfied. That the end-organ is sensitive to the general condition of the entire body is evidenced by the fact that the sensation of thirst may be appeased, in extreme need, by the injecting of fluids into the tissue or veins; also, in extreme loss of moisture, no amount of local moistening will cause thirst to disappear.

Water is absolutely essential to the maintenance of life. It forms almost three-fourths of the weight of the body, and is found in all its organs and tissues. While it is taken into the body every day through the process of eating, for practically all foods contain water, health is benefited by the copious drinking of this liquid. Authorities advise the person in normal health to drink six or eight glasses a day. If regular habits of drinking water are cultivated and persisted in, a healthy thirst can be created, and this should be the aim of every one. Such a thirst makes the individual a water-drinker in cold as well as in hot weather, when every one drinks freely to offset the loss occasioned by the increase of perspiration. The unnatural thirst that accompanies fever, diabetes, and various other diseases is caused by rapid reduction of the body fluids. Care should always be taken to drink pure water (see FILTER).

K.A.E.

THIRTEEN ORIGINAL COLONIES. See UNITED STATES (Summary of History).

THIRTY-NINE ARTICLES, the statement of the religious belief of the members of the Church of England (which see). They are based on forty-two articles drawn up in the reign of Edward VI (1551) by a commission of eight bishops, eight clergymen, eight civilians, and eight lawyers, Ridley, Cranmer, and Coverdale being among the number. Immediately after their publication, Edward died. Queen Mary would not acknowledge the Articles, but under Elizabeth, Archbishop Parker revised them, reducing them to thirty-nine. They were confirmed by the queen in 1563, and were ratified anew in 1604 and 1628. By the Clerical Subscription Act of 1866, the clergy do not have to sign these Articles, but declare their belief in them and in the Prayer Book. Since 1871, members of Oxford and Cambridge universities (except divinity students) have not been obliged to sign them. The Thirty-nine Articles are now accepted by the Episcopal churches of Scotland, Ireland, and America, the latter having adopted them, with a few slight changes, at its General Convention of 1801.

THIRTY TYRANTS, a body of rulers representing the aristocratic party at Athens, appointed by the Spartans when they gained supremacy after the Peloponnesian War. They were given dictatorial power in all matters in the state, and under the brilliant but unscrupulous Critias, they plotted to establish their rule permanently, installing at Athens a Spartan military governor and garrison. They disarmed all the citizens except their own adherents, and put to death many wealthy members of the opposing party. In 403 B.C., after about a year of this reign of terror, the old democracy was restored. See PELOPONNESIAN WAR.

THIRTY YEARS' WAR, the last of the great religious wars of Europe. It was really a series of conflicts covering the period between 1618 and 1648. Though it began as a civil war in Germany, between the Protestant and Roman Catholic parties, most of the nations of Europe were drawn into it, one by one, and it ended as a general struggle for territory and political power.

Causes. The underlying cause of the war was the old, deep-seated hostility between the German Protestants and Roman Catholics, intensified by the different ways in which they interpreted the Treaty of Augsburg (1555), especially with reference to Church property. Both parties had violated the treaty at will.

The Outbreak in Bohemia (1618-1623). In 1608 the Protestants began to get ready for the inevitable clash by organizing the Evangelical Union. The Catholics retaliated with the Holy League. It needed only a special provocation on either side to bring matters to a head. That came when the Archbishop of Prague ordered the destruction of a church which the Protestants had begun to build. In anger, the people appealed to the king, Ferdinand II, but he was an ardent Catholic and ignored their protests. The majority of the populace were Protestants, and they took this as the signal for revolt. The event with which it began is known in history as the Defenestration of Prague. (*Defenestration* is from *femestra*, the Latin word for *window*.) It was an old Bohemian custom for the people to punish offending officials by throwing them out of a window, and this treatment the mob applied to two of the king's ministers. This act precipitated the civil war that had so long been threatening.

At first, the Protestants met with success. They drove out the Jesuits and elected Frederick, the Palatine elector, as their king. But soon the fortunes of war began to favor the other side. Their own Evangelical Union held back its support out of jealousy, for Frederick belonged to the Calvinists, whereas the Union was strongly Lutheran. To make matters still worse for the popular cause, Ferdinand II—a member of the powerful Austrian House of Hapsburg—was made Holy Roman Emperor shortly after the revolt started, which naturally put new power into his hands. He was thus able to win an overwhelming victory at the Battle of the White Mountain, after which he sent his hosts throughout the length and breadth of Bohemia and the Rhine country, to pillage and destroy, until the insurrection was thoroughly stamped out. In the end, the Bohemian Protestants were deprived of the special religious privileges they had enjoyed, and Catholicism once more became the religion of the land.

The Danish Period (1625-1629). With things at such a pass in Bohemia, it was natural that the other Protestant states should begin to look to their own security, and consider the necessity of checking the ambitions of their zealous emperor. It was the king of Denmark, Christian IV, who took the first step. Enlisting the aid of one or two other states, and helped by a subsidy from England, he opposed Ferdinand's forces in Saxony. But the emperor had received unexpected assistance from Wallenstein, Duke of Friedland, who raised an immense army of adventurers and foreign mercenaries. This army he

placed at the emperor's service without expense, the understanding being that they were to take payment by plundering as they went. Such an arrangement naturally meant untold suffering for the German people, and brought about tragedies that are remembered even to-day, after three hundred years, in the tales the peasants tell their children. This army, and the forces of the Holy League under the great general Tilly, defeated the Danish king time after time, and he finally withdrew, after signing the Peace of Lubeck (1629). Even before that, the emperor had issued the Edict of Restitution, in accordance with which all Church possessions acquired by the Protestants after the Peace of Augsburg were returned to the Catholic side. Here was a source of further friction.

The Swedish Period (1630-1635). The "Lion of the North," Gustavus Adolphus, the great hero-king of Sweden, now entered the combat. He had two motives for interfering: his sincere devotion to Protestantism; and his ambition for Sweden, whose position on the Baltic would be endangered if the emperor succeeded in his plans. This was the first introduction of the political element. In 1630, therefore, Gustavus Adolphus sailed with 16,000 men—the best trained and best-disciplined army in all Europe. He tried to relieve the city of Magdeburg, under siege because of resisting the Edict of Restitution, but arrived too late to prevent its capture. The sacking of the city was so frightful a catastrophe that Tilly compared it to the fall of Troy and of Jerusalem. However, the Swedish army defeated Tilly's forces in the Battle of Breitenfeld (1631), and the following year in another conflict, in which Tilly was killed.

Emperor Ferdinand was now forced to recall Wallenstein, previously dismissed, and another nondescript army from all over Europe was gathered. It met the Swedish forces in the famous Battle of Lutzen (1632), and Wallenstein's army was driven from the field. In a thick mist that covered the field with darkness, Gustavus Adolphus lost his way and somehow met his death; the spot where he fell is now marked by a splendid monument, which the Germans have erected in gratitude to the illustrious prince who saved the Protestant cause. The Swedes continued the struggle, with varying success, until 1634, when the model army of Gustavus was destroyed in the Battle of Nördlingen. At about this time, the emperor, seeing cause to suspect Wallenstein of treason, had him assassinated by his own lieutenants.

Swedish-French Period (1635-1648). The war now lost the religious character entirely, and became purely political. Richelieu, the real ruler of France at this time, was a Catholic, but he determined to interfere in behalf of the German Protestants, as a means of blocking the growth of Hapsburg power, for France and Austria had been enemies for hundreds of years. In fact, he had assisted Gustavus Adolphus with influence and supplies. In 1635 he adopted direct tactics and flung a French army into Germany. This force united with a new Swedish army, and, under the brilliant leadership of Turenne and Condé, as well as the Swedish generals Torstensson and Wrangel, a long series of victories was achieved, and the Protestants of Germany took fresh heart.

The Peace of Westphalia (1648). The people had long been crying for peace and relief from the misery this dreadful war brought

upon them. In 1645 the European powers sent representatives to a peace conference, the Catholic and Protestant delegates meeting separately in two different cities of Westphalia. Tedious negotiations continued, until finally, in 1648, the news that the Protestant armies were planning operations against Vienna brought certain concessions from the emperor. These made possible the agreement known as the Peace of Westphalia, which gave religious freedom to the German states.

Effects of the War. Pitiable indeed was the condition of Germany at the close of the war. More than half the population had been killed, and the survivors saw nothing but ruin wherever they looked. Whole cities, villages, and farms had disappeared; two-thirds of the tangible property had been destroyed. Wild animals that had been driven out as the country became civilized had returned to the wilderness which war recreated. Art, science, commerce, and industry were dead. There had been no time to educate the children. Thirty years of fighting had brought a lowering of moral standards, and attracted to Germany, as well as developed within Germany, vicious characters from whom the country suffered for several generations.

Related Subjects. In connection with this discussion of the Thirty Years' War, the following articles in these volumes may be consulted:

Augsburg Confession	Reformation, The
Germany (The Thirty Years' War)	Richelieu, Cardinal
Gustavus (II, Gustavus Adolphus)	Tilly, Count of
Lützen, Battles of	Wallenstein
	Westphalia (Peace of Westphalia)

THISBE, *this' be*. See PYRAMUS AND THISBE.

THISTLE, *this'll*, the name applied to a widely distributed group of plants bearing sharp spines or prickles. They are members of the composite family and are mostly weeds. Of the numerous species, the most troublesome is the so-called *Canada thistle*, described and illustrated in these volumes under that title. This is a European species that has become a pest in the United States and Canada. Thistle plants have tough, fibrous stems, much-divided, prickly leaves, and soft, silky flowers of various colors, usually borne in round heads that form large, downy seed balls after the blossoms wither. The seeds are scattered far and wide by the winds, and thistles therefore multiply rapidly. They also produce vigorous root-stocks, and the complete uprooting of a plant is often a difficult matter. Fragments left in the soil may cause the growth of new plants. The eradication of thistles from grain fields is thus a serious problem. Annual species must be cut down before the flowers bloom.

It is supposed that the plant adopted by the Scots as their national emblem is the species

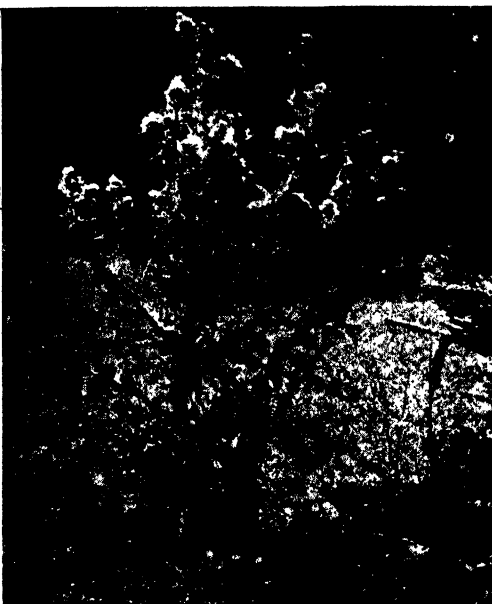


Photo at right: Visual Education 8

THE THISTLE BLOSSOM AND THE PLANT

known as *cotton thistle*, so called because it has a covering of white down. Various other species, however, have been given this honor. A number of plants similar to thistles are sometimes called by that name. Conspicuous among these is the *Russian thistle*, or *tumbleweed* (which see), a spiny-leaved plant of the goose-foot family that has caused farmers in Western United States much trouble. B.M.D.

Scientific Names. The term thistle is strictly applied to the species of *Carduus*, *Cirsium*, or *Cnicus* of the family *Compositae*. The Canada thistle is *Cirsium arvense*; the Scots thistle, *Cirsium acaulis* or *Onopordon acanthium*; and the so-called Russian thistle, *Salsola tragus*.

THISTLE, ORDER OF THE, a royal order of Great Britain, conferred only upon peers of Scotland. A considerable antiquity is claimed for it, but, according to trustworthy records, it was founded in 1540 by James V of Scotland. It was dedicated to Saint Andrew, and bears the alternative title, Order of Saint Andrew. James II of Great Britain reorganized the Order in 1687, and Queen Anne revived it in 1703, when to the eight knights companions, who with the sovereign made up its original membership, four more were added. In 1827 the number of knights companions was fixed at sixteen, and no subsequent change has been made. The thistle is prominent on the badge and collar of the Order, which has as its appropriate motto *Nemo me impune lacessit* (No one injures me with impunity).

THISTLE-BIRD. See AMERICAN GOLD-FINCH.

THIVAI, the' veh. See THEBES (Greece).

THLINKITS, a group of Alaskan Indians, allied to the Eskimos. See ALASKA.

THOMAS, AUGUSTUS (1859-), a foremost American dramatist, author of several plays that show his mastery of the technique of the drama. Notable among these are his *Alabama*, *Arizona*, and *In Mizzoura*, which also illustrate his fondness for using local color, and *The Witching Hour*, which deals with the power of hypnotism. Thomas was born in Saint Louis, Mo. Before he became a playwright, he had a varied career as page boy in Congress, law student, employee in a railroad freight house, newspaper writer, and editor and proprietor of the *Kansas City Mirror*. His first play, *Alabama*, was successfully produced in 1891, and thereafter he gave his whole time to dramatic work. In 1915, after the death of Charles Frohman, who was lost on the *Lusitania*, Thomas became art director of the Frohman theatrical enterprises. He was chosen executive chairman of the Producing Managers' Association in 1922.

Other Plays. Among his plays not mentioned above are *The Hoosier Doctor*, *The Man Upstairs*, *Oliver Goldsmith*, *The Earl of Pawtucket*, *Mrs. Leffingwell's Boots*, *The Education of Mr. Pipp*, *The Embassy Ball*, *The Harvest Moon*, *As a Man Thinks*, *Rio Grande*, *The Copperhead*, and *Palmy Days*.

THOMAS, GEORGE HENRY (1816-1870), an American military leader who gained the title "Rock of Chickamauga" for his steadfastness in one of the most desperate battles of the War of Secession. In that battle, his unflinch-

ing courage saved the Union army from total defeat.

Thomas was born in Southampton County, Va. After his graduation at West Point, in 1840, he fought against the Seminole Indians in Florida, and in the Mexican War, distinguishing himself repeatedly for gallantry in action. From 1851 to 1854, he served as instructor at the national Military Academy, and for five years commanded (as major) the Second Cavalry in Texas. When the War of Secession began, he remained loyal to the Union, though a Southerner by birth. It was in September, 1863, that he became a Union hero, through his gallant conduct at Chickamauga. Soon after, he was made commander of the army of the Cumberland, which was conspicuous in the great victory of Chattanooga. When, in December, 1864, he crushed Hood's army at the Battle of Nashville, Thomas was promoted to be major general in the regular army, and given a vote of thanks by Congress. After the war, he commanded military departments in Kentucky and Tennessee, until 1869, when he assumed command of the Division of the Pacific, with headquarters in San Francisco, where he died. See WAR OF SECESSION.



Photo: Brown Bros

GEORGE H. THOMAS

THOMAS, JESSE B. See MISSOURI COMPROMISE.

THOMAS, MISS M. CAREY. See WOMEN, TWELVE GREATEST AMERICAN.

THOMAS, SAINT. See APOSTLES.

THOMAS, SETH, a Connecticut clock-maker. See CLOCK; CONNECTICUT (Inventors and Their Inventions).

THOMAS, THEODORE (1835-1905), an American musician and orchestra conductor, born at Esens, East Friedland, Germany. His musical training was received mainly from his father. He played the violin in public when only five years old, and at the age of ten began to give public concerts. In 1845 he was brought by his parents to America, played with various New York orchestras for two years, and in 1850 accompanied Jenny Lind, as first violinist, on her first American tour. In spite of his ability as a musician, life was a bitter struggle for him for some years, and he himself declared that there were many times when he was so nearly frozen that he could not finger the violin, upon reaching the orchestra pit.

In 1861 he began the formation of his own orchestra, and within three years had raised it to such a standard that he was invited by patrons of music in New York to give symphony concerts there. By 1869 the organization was known throughout the world, and was in constant demand for tours of the larger American cities. In 1872 he founded the Wagner Union. Thomas accepted the directorship of the Cincinnati College of Music in 1878, but failed to find there the scope of work he desired, and two years later he returned to New York. He became conductor of the Brooklyn Philharmonic Society, and once more showed his qualities as an inspiring leader, by the skill developed in that organization.

In 1890 he went to Chicago, where, again, he established one of the world's greatest orchestras, now known as the Chicago Symphony Orchestra. For years there was annually a heavy deficit, but Chicago music patrons gladly paid the debts incurred in presenting music of so high a standard. Thomas absolutely refused to present music of a low type, and he lived to see audiences able to appreciate his musical ideals. In 1904 a recital hall costing \$750,000 was erected in Chicago, especially for his orchestra, but within a few months of its completion, overwork exhausted him, and he died early in the next year. A monument to his memory occupies a site in Grant Park, Chicago, opposite Orchestra Hall. Frederick Stock (which see) succeeded him as conductor of the Chicago orchestra.

THOMAS À BECKET. See BECKET, THOMAS À.

THOMAS À KEMPIS (about 1380-1471), a religious writer, reputed author of *Imitation of Christ*, one of the most famous devotional books ever written. He was born at Kempen, in the Lower Rhine district, of a peasant family whose name was Hammerken. He acquired a good education in a famous school at Deventer, and about the year 1400 entered the Augustinian monastery of Mount Saint Agnes, near Zwolle. In 1413 he was ordained a priest, and thereafter lived in quiet at Mount Saint Agnes, becoming subprior in 1425. He was called Thomas from Kempen, after the fashion of the time in the schools; this became Thomas à Kempis, a name known throughout the Christian world.



Photo: Brown Bros.

THEODORE THOMAS

Summary of His Work. He wrote *Meditations on Christ's Life*, *The Soul's Soliloquy*, and *Garden of Roses*, but these are practically unnoticed, because of the greater fame of his *Imitation of Christ*, which has passed through many hundred editions in all languages. There is still, it is true, some controversy about the authorship of this work, but it is almost universally accredited to Thomas à Kempis. A manuscript copy of it, in his own hand, exists, but this is not positive proof, as all monks were zealous copyists of good books.

This book, which has been more widely read than any other religious writing except the Bible, grew out of the author's monastic life, and aims to give counsel to all who are seeking the path to righteousness. Thomas à Kempis, whose piety seems to have been of the most genuine and humble character, finds the root of all good in love, the root of all evil in lack of it. People of distinction and power, in every age since his own, have been profoundly moved by the book; Luther, Samuel Johnson, George Eliot, and Lamartine are but a few of those who have admitted their indebtedness to it.

THOMPSON, DAVID (1770-1857), a Canadian explorer, the first white man to follow the course of the Columbia River from its source to its mouth. Thompson was an Englishman by birth, and attended Oxford University, but abandoned his studies, at the age of nineteen, to enter the service of the Hudson's Bay Company in Canada. For some years he was a clerk for this company, but after 1797, when he became an employee of the Northwest Company, he gave practically all of his time to exploration. In 1798 he discovered Turtle Lake, one of the sources of the Mississippi River. Four years, 1807 to 1811, he spent in the valley of the Columbia, and for ten years, 1816 to 1826, worked on the Canada-United States boundary survey. Later, he had charge of various surveying and exploring expeditions in the Canadian Northwest.

THOMPSON, DENMAN (1833-1911), an American actor who endeared himself to a nation with the humorous character, Joshua Whitcomb, in *The Old Homestead*, created and acted by him for many years. He was born at Beechwood, Pa. When he was seven years old, his parents moved to New Hampshire. Thompson cared little for school, and at the age of seventeen ran away with a circus, serving as an acrobat for a year. He then returned home and tried to be content in the mercantile business, but the lure of the stage was too strong, and in 1853 he joined a theatrical stock company at Worcester, Mass.

For some years he played unimportant parts in Canada, the United States, and England. In 1875 he wrote *Josh Whitcomb*, a sketch showing the peculiarities of the old-fashioned New England farmer, and this was so successful that he rewrote it as a play. In 1887 he again enlarged and revised this comedy, which, under the name of *The Old Homestead*, was enthusiastically received at its first performance in

New York, ran there for four years, and toured the country for many seasons afterward. Thompson also wrote *The Sunshine of Paradise Alley*, but he is remembered for the one vivid character of rural life that he gave to American drama.

THOMPSON, ERNEST SETON, the baptismal name of Ernest Thompson Seton (which see).

THOMPSON, FRANCIS (1850-1907), an English poet, the son of a Roman Catholic physician of Lancashire. Like Keats, he studied medicine, but abandoned that profession when his absorbing interest in writing led him to London. There, after five years of hardship and privation, his poems attracted the interest of Wilfrid and Alice Meynell, themselves writers of distinction and members of his own religious faith. With their help, he published, in 1893, a volume of poems which first brought widespread and favorable attention to him. He later published *Sister Songs* (1895), *New Poems* (1897), and a prose treatise, *Health and Holiness*, on the ascetic life. Tuberculosis followed his years of hardship, and caused his death.

The compelling beauty of vision and expression in Thompson's poems gives him a distinctive place among poets of his time; appreciation of him grows, rather than diminishes. The mystical poem, *The Hound of Heaven*, is probably his best-known work.

Other Prose Works. Besides the prose treatise mentioned above, Francis Thompson wrote *Life of Ignatius Loyola*, *Life of John Baptist de la Galle*, and an *Essay on Shelley*.

THOMPSON, MRS. FREDERICK FERRIS. See VASSAR COLLEGE.

THOMPSON, [JAMES] MAURICE (1844-1901), an American writer, best known as the author of *Alice of Old Vincennes*, a romantic novel of Revolutionary days. This entertaining and well-written story—his best literary achievement—was published the year before his death, and was the culmination of a group of writings that included poems, literary reviews, books on nature study, and a treatise on archery. Always a lover of outdoor sports, he was an enthusiast on the subject of the bow and arrow. Thompson was born in Fairfield, Ind., but spent most of his boyhood in Georgia and Kentucky, and while still a youth served in the Confederate army. After the war, he returned to his native state, settling in Crawfordsville. There he engaged in law practice and civil engineering, and at the same time began his career as a writer. He joined the staff of the *New York Independent* in 1890, and wrote a large number of its book reviews. His style was fresh and unconventional, and his books bore testimony to an enthusiastic love of nature and out-of-door life.

His Writings. Besides *Alice of Old Vincennes*, his books include *Hoosier Mosaics*, *The Witchery of Archery*, *Songs of Fair Weather*, *By-Ways and Bird Notes*, *The Boy's Book of Sport*, *Sylvan Secrets*, *The Story of Louisiana*, *The Ethics of Literary Art*, and *My Winter Garden*.

THOMPSON, SIR JOHN SPARROW DAVID (1844-1894), a Canadian jurist and statesman, Premier of the Dominion from 1892 until his death. Sir John became Premier at a time when the Conservative party was showing signs of disintegration. He planned many reforms, not merely for the party but for the Dominion, but he died before he could put many of these into effect.

Thompson was born at Halifax, N. S. There he studied law in a barrister's office, and was called to the bar in 1865. From the first he took an active interest in political affairs, and in 1877 was elected to the Nova Scotia assembly. A year later, he entered the provincial cabinet as attorney-general, and in 1882 became premier of Nova Scotia. He held office for only a few weeks, resigning to become chief justice of the provincial supreme court. In 1885, however, he again entered politics, accepted the place of Minister of Justice in the Macdonald Cabinet, and was elected to the Dominion House of Commons from Antigonish. In 1887 he was legal adviser to the British representatives who negotiated the Fisheries Treaty with the United States, and in 1893, while Premier, he was one of the arbitrators of the Bering Sea Controversy. Sir John died in Windsor Castle, where he had just taken the oath as a member of the Privy Council. Queen Victoria in 1887 conferred on him the honor of Knight Commander of the Order of Saint Michael and Saint George.

THOMSEN, C. J. See **ARCHAEOLOGY** (The Development of Archaeology).

THOMSON, CHARLES EDWARD POULETT. See **SYDENHAM, BARON.**

THOMSON, JAMES (1700-1748), a Scottish poet, born at Ednam, Roxburghshire. He was educated for the ministry at the University of Edinburgh, but abandoned his profession and went to London.

There he composed *The Seasons*, a series of poems in blank verse that became popular as soon as they appeared, between 1726 and 1730. In 1730 he started on a two years' tour of Europe as tutor to the son of Sir Charles

Talbot, afterward Lord Chancellor, who, upon his return, gave him an easy, but lucrative, government position. The income from this office ceased with Talbot's death, in 1737, but Thomson was granted a pension, and in 1744 was made surveyor-general of the Leeward Islands. In the meantime, he revised and enlarged each poem of *The Seasons*.

Other Works. *The Castle of Indolence*, Thomson's last work, is based on Spenser's *Faerie Queene*. Among his other writings are the tragedy *Tancred and Sigismunda* and, with Mallet, the masque of *Alfred*, containing the famous patriotic hymn *Rule Britannia*. Thomson's poems were the first to show the change from interest in mere form to a less restricted treatment of the beauties of nature.

THOMSON, WILLIAM. See **KELVIN, BARON.**

THOR, *thawr*, in Northern mythology, the god of thunder, eldest son of Odin. He was the strongest of the gods, and their champion in the almost incessant wars against the giants. As a child, Thor was noted for his size and great strength. Ordinarily, he was a good-natured boy, but sometimes he fell into such terrible passions that his mother was unable to control him, so she gave him into the charge of foster parents, who brought him up very wisely. When he had grown to maturity, he built in Asgard a wonderful palace which he named Bilskirnir (lightning). Thor was especially the god of peasants and the laboring classes. In the 540 halls of his great palace, he met his favorite dead, warriors who had fallen in battle, and feasted with them, as Odin did with their masters.

Thor's wife was Sif, whose chief attraction was her long, golden hair, which covered her from head to foot like a veil. One morning, Sif awoke and found her beautiful hair all gone. Thor, who admired it excessively, vowed that he would punish the thief most severely. He suspected Lok as the culprit, and, having followed him through numerous changing forms, at last captured him and compelled him to admit that he had taken Sif's golden hair. Thor, however, consented to let the traitor go if he would procure a new head of hair as beautiful as the first.

At once, Lok proceeded to the realm of the dwarfs, where he begged Dvalin to make the hair, and at the same time prepare presents for both Odin and Frey, whose anger he wished to disarm. For Odin, the dwarf made the famous spear which never failed in its aim, and for Frey the ship which sailed over land as well as water; and then he spun, from the finest gold thread, the long tresses which were warranted to grow luxuriantly again, as soon as they touched the head of Sif. The skill with which this was done led to wagers being laid among the dwarfs, and, as a result of their competition, they made many other magic things which the gods afterward possessed. They



Photo: Brown Bros.

JAMES THOMSON

made for Odin the enormous boar with its golden bristles; for Frey, the magic ring of gold from which, every ninth night, eight similar rings dropped; and a magic hammer which came back to the hand that threw it. This last gift was for Thor. The hammer was always red hot, and even the handle was so heated that the god was obliged to wear an iron gauntlet, in order to use it. Besides this, Thor possessed a magic girdle which doubled his strength whenever he drew it around his body.

As Thor rode about the heavens in his brazen chariot drawn by two goats, from whose teeth and hoofs sparks were constantly flying, the lightnings flashed from his hammer, and as he threw it through the air, the thunder roared. Thursday is Thor's day. See ODIN; FREY; LOK.

In Art and Literature. In art, Thor is represented as a man in the prime of life, tall, well formed, with bristling red hair and beard, and strong, muscular limbs. Literature contains numerous references to the hammer of Thor.

THORACIC DUCT, *tho ras' ik duk't*, the main collecting trunk of the lymphatic system. It is the great trunk which receives the lymph from all of the body below the diaphragm, and from the left half of the body above the diaphragm. This duct, or canal, which is about the size of a goose quill and from fifteen to eighteen inches long, begins below at about the level of the second lumbar vertebra, in a dilated portion called the *receptaculum chyli*, or *receptacle of the chyle*, and extends up along the front of the column to the seventh vertebra of the neck; there it curves forward and downward, opening into the junction of the left jugular and left subclavian veins. Lymphatics from the right half of the body above the diaphragm open into the right subclavian vein. K.A.E.

Related Subjects. See color diagram under BLOOD. See, also, LACTEALS; LYMPH (The Lymphatic System).

THORAX, *tho' raks*. See CHEST; also ABDOMEN, for illustration.

THOREAU, *tho' ro*, or *tho ro'*, HENRY DAVID (1817-1862), an American naturalist and writer, was born at Concord, Mass., of Scottish and French descent. His father had been a merchant, but had taken up the manufacture of lead pencils, an occupation which Thoreau also followed at times. His love of nature was manifested early; when only twelve, he made

collections for scientific study. He was graduated from Harvard in 1837, and in the same year began his lifelong habit of keeping a journal. For several years he taught school at Concord and on Staten Island, N. Y., and delivered lyceum lectures in New England. Meantime, he took a boating trip with his brother on the Merrimack River, and his description of this outing, with his reflections by the way, later made up his first volume—*A Week on the Concord and Merrimack Rivers*. One thousand copies were printed, but only about two hundred were sold, and the rest were sent back to



THOR, GOD OF THUNDER

the author, who used to say thereafter, "I have now a library of nearly nine hundred volumes, over seven hundred of which I wrote myself."

A Life of Seclusion. In 1841-1843 and 1847-1848, Thoreau lived with Emerson; but part of the interval between, he spent in a hut on a pine slope at Walden Pond, near Concord, where he enjoyed a sort of hermit's life. He wished to prove his doctrine that a man could live naturally, earn what he needed, and have large leisure for study and culture. His home, which he built with his own hands, cost him twenty-eight dollars; he lived very frugally, supported himself by odd jobs of surveying and boat-building, visited among his neighbors, read widely in several languages, wrote for magazines, and kept a journal which he later revised and published under the title *Walden*,

or Life in the Woods. This book, probably his best work, shows few discoveries, but proves its author to have been a minute observer. His familiarity with the creatures of the woods was nothing short of remarkable; the birds came when he called, the animals showed no fear of him, and even the fish he could lift from the water with his hands.

Thoreau, who never married, spent most of his life, after leaving Walden, with his parents and sister at Concord, and in tramping trips in the Maine woods, about Cape Cod, and in Canada; and his later works are but repetitions with variations, of his earlier ones. His style is original and stimulating, and his writings, neglected for a time, are now taking higher and higher rank. He wrote some verse, which has the charm of force and originality, but which lacks warmth and melody.



Photo: Brown Bros.

HENRY D. THOREAU

Unusual Character. There has been much discussion as to Thoreau's character, his admirers holding that his independence and uprightness of spirit set him far above ordinary men; his detractors, on the other hand, declare that his difference from those about him was mere self-conscious eccentricity. It is true that he indulged in many vagaries. He refused to vote, to attend church, or to pay taxes, thus registering his protest against what he felt was an artificial life. He was not a hermit in the true sense of the word, however, for he had many valued friends, and visited freely among his neighbors. His bold public defense of John Brown, of anti-slavery fame, proved that he did have, at times, an interest in others besides himself.

His Writings. The two volumes mentioned above were the only works of Thoreau published in his lifetime, but several volumes, largely composed of material from his journal, were published after his death. They include *Excursions*, *The Maine Woods*, *Cape Cod*, *Early Spring in Massachusetts*, *Miscellanies*, and *Familiar Letters of Thoreau*. His fame rests largely on *Walden* and the *Excursions*.

THORIUM, a heavy metallic element, the dioxide of which, called *thoria*, is used in the manufacture of incandescent gas mantles, of which the United States consumes annually about 90,000,000. The element, which was discovered in 1828 by a Swedish chemist, is a gray powder which burns with a bright flame when heated in air; it occurs in monazite, orangite, thorite, and similar minerals. Tho-

rium has a wide distribution, though it occurs nowhere abundantly. Brazil, Norway, and North and South Carolina are important sources of supply. The monazite sands of North Carolina are exploited for the extraction of the oxide. Thorium is one of the radioactive elements (see RADIOACTIVITY). Its chemical symbol is *Th* [see CHEMISTRY (The Elements)]. T.B.J.

THORN, in botany, is a short, hard, sharp-pointed, and leafless branch, as of the hawthorn or the honey locust; it develops from a bud, like tree branches. The term is also applied to any thorn-bearing shrub or small tree, or its wood; especially, to the hawthorn and the blackthorn.

THORN APPLE. See STRAMONIUM.

THORNYCROFT, WILLIAM HAMO. See SCULPTURE (England).

THOROUGHWORT, *thur' o wurt*. See BONESET.

THORPE, ROSE HARTWICK. See CURFEW (A Poetic Theme); BELL.

THORWALDSEN, *torw' wawld sen*, BERTEL (1770-1844), the foremost sculptor of Denmark, and one of the greatest of modern times. Like the great Italian Canova, he was the exponent of classicism [see SCULPTURE (Italy)], but he followed the Greek ideal more closely than his famous contemporary, and his works suggest, more than those of any other sculptor of his day, the serene beauty and purity of ancient Greek masterpieces. He was the son of an Icelander, a wood-carver. At the age of eleven, Thorwaldsen began his art studies in the academy of Copenhagen, his birthplace. When he was twenty-three, he won a gold medal and a scholarship which permitted him to study in Rome. Here his work received generous recognition from Canova, especially the plaster cast of a colossal *Jason with the Golden Fleece*. His first important commission (1803) was an order to reproduce this noble statue in marble, and, having once gained a reputation, he advanced rapidly in fame and fortune.

Among the famous works which he executed within the next few years were a frieze entitled the *Entry of Alexander the Great into Babylon* (in honor of Napoleon's expected visit to Rome), and the model for the *Lion of Lucerne*, a memorial to the Swiss Guards who died in heroic defense of the Tuileries, in Paris. This latter was copied by the Swiss sculptor Ahorn when he chiseled the sleeping lion out of the solid rock at Lucerne (see illustration accompanying the article SWITZERLAND). In 1819 Thorwaldsen returned to Copenhagen, and was greeted there with a reception that was a personal triumph. During a brief sojourn in the city, he received a commission to decorate the Church of Our Lady, and among the figures executed for this purpose is a colossal series of statues of Christ and the Twelve Apostles that

will always be regarded as among his masterpieces. These were not completed until 1838.

Returning to Rome, Thorwaldsen made for Saint Peter's a monument to Pope Pius VII, and executed many other important commissions. In 1825 he was elected president of the Accademia di San Luca, an honor not usually accorded to a Protestant. A subsequent return to Copenhagen, at the king's request, was made in a Danish frigate, and on the return journey to Rome, he made a triumphal progress. The last two years of his life were spent in his native city, and all his possessions were left to that municipality for the establishment of the Thorwaldsen Museum. In this institution are preserved the plaster models or originals of all of his sculptures, besides many other art treasures. His remains lie in the courtyard of the museum, buried under a bed of roses, by his special wish. His influence on contemporary and later artists was far-reaching, and he had a large share in bringing about the classic revival of the nineteenth century. Among his important works, besides those already mentioned, are *Cupid and Psyche*, *Memorial to Baroness Schubarth*, *Four Seasons*, and the medallions *Morning and Night*.

THOTH, *thoth*, or *toht*, an Egyptian god of wisdom who was the author of art, science, speech, and letters. He was represented with the head of an ibis or a dog, and with a tau cross in his hands. The records of judgment in the halls of Osiris were kept by him. He is identified with the Greek Hermes.

THOTHMES III, *thoth' meez*, or *toht' maze*, called THE GREAT, a king of ancient Egypt, under whom the country came to the zenith of its prosperity. Through a long series of conquests, including fourteen Asiatic campaigns, he subjugated Syria, Palestine, and part of Mesopotamia—almost all the territory, in fact, from the Nile to the Euphrates. On the walls of the great temple of Ammon, at Karnak, he had vainglorious accounts of his campaigns inscribed, erasing the names of earlier rulers to make room for his own. He built many temples, using in that way much of the wealth ravaged from his subject territories, and he erected the famous obelisks known as Cleopatra's Needles, one of which stands now in Central Park, New York, and another on the Thames Embankment, in London. The dates of his reign are uncertain, but it seems that he came to the throne about 1528 B.C., and died about 1475 B.C. His mummy, like those of Seti I and Rameses II, was discovered in 1881 at Deir-el-Bahri.



Photo: O R O C

THOTHMES III

Statue of the Egyptian conqueror, in the museum at Cairo.

THOUGHT, *thawt*. The mind is a storehouse furnished with bits of knowledge which are either innate or have been gathered by observation, reading, and reflection. Thought is the blending, or weaving together, of these bits of knowledge into new and abstract ideas. For example, we may perceive a particular object, such as the Mississippi River, and observe its color and current, or remember when it was discovered, but when we piece together the products of our observation and reading, and concentrate our attention upon some particular attribute of the river, such as its importance to commerce, or its relation to other rivers, we are said to *think*, or to arrive at our conclusion by processes of *thought*. The observation of an object is often unconscious and performed involuntarily, but thought, or the singling out of a particular attribute of the object, requires conscious effort. We think only when we have

some purpose, such as that of discovering likenesses and differences. Oliver Wendell Holmes says that "a thought is often original, though you have uttered it a thousand times. It has come to you over new routes by a new train of association."

The psychologist seeks to discover *how* we think. He divides the powers of the mind into *feeling*, *intellect*, and *will*, each of which is more or less represented in every mental act. Every thought is accompanied by a certain amount of feeling and is colored by it, while the will controls thought. The poet Lowell says:

All thought begins in feeling—wide
In the great mass, its base is hid,
And narrowing up to thought stands
glorified,
A moveless pyramid.

Similarly, there is thought in all emotion, and here again the controlling agency is the will.

Further, there are both thought and feeling in every act of will. The first step in the process of thought is *analysis*, or *abstraction*, which is the singling out of the characteristics and qualities of an object and the concentration of the mind upon one of these. The next step is known as *synthesis*, or the combining and relating of the qualities of a certain thing to those of other objects, and comparing them to determine their likenesses or differences.

This concentration of the mind always involves a muscular tension and an adjustment of the nerves and muscles, especially those controlling the movements of the eyes and head, and intense thought cannot be maintained for long periods at a time without physical exhaustion.

The logician is interested, not in the processes of thought, but in how to think *correctly*, and divides thought into three stages: first, the formation of a general idea, which he calls *conception*; then the combination of concepts to form a statement, or judgment; and, lastly, the passing from one judgment to another, or the process of reasoning and drawing a conclusion.

Method and concentration are required to produce clear thought. Writing and conversation constitute the harvesting of thought. Not only do they enable us to give our ideas definite form, but they suggest new ideas and open new channels of thought.

"Thoughts shut up want air

And spoil like bales unopened to the sun."

The influence of thought upon character is incalculable, for thought is the impelling force of every deed. "As a man's thoughts are, so is he" is a saying so old and well known as scarcely to need repeating. It is thought that distinguishes man from animal, and civilization from barbarism, and it is thought that has produced the moral, scientific, and economic development of the world. C.E.S.

Related Subjects. In connection with this article on thought, the reader is referred to the following articles in these volumes

Apperception	Judgment
Association, Law of	Logic
Attention	Memory
Brain	Mind
Concept	Perception
Feeling	Psychology
Imagination	Reason
Interest	Will

THOUGHTFULNESS. See CHARACTER TRAINING (Thoughtfulness Is Important).

THOUSAND AND ONE NIGHTS. See ARABIAN NIGHTS.

THOUSAND ISLANDS, THE. See SAINT LAWRENCE RIVER, subhead.

THOUSAND SPRINGS, THE. See IDAHO (Rivers).

THRACE, *thrays*, the ancient name of an extensive region in the Balkan Peninsula. Its boundaries varied at different periods of its history. It was situated to the north of Macedonia, and possessed rich agricultural lands and had also great mineral wealth. At one time the territory called Thrace extended from Macedonia to the Danube, and eastward as far as the Black Sea; while under the Romans, Thrace was the region south of the Balkans.

The Thracians were of Indo-European origin, akin to the Phrygians of Asia Minor. They were barbarians, warlike and fond of plunder, and were ruled by many petty kings. After having been made nominally dependent on Persia, the Thracians were subdued by Macedonia about 399 B.C. They regained their independence for a short time on the fall of Macedonia, but were conquered by the Romans, and Thracia became a Roman province in 133 B.C. Its

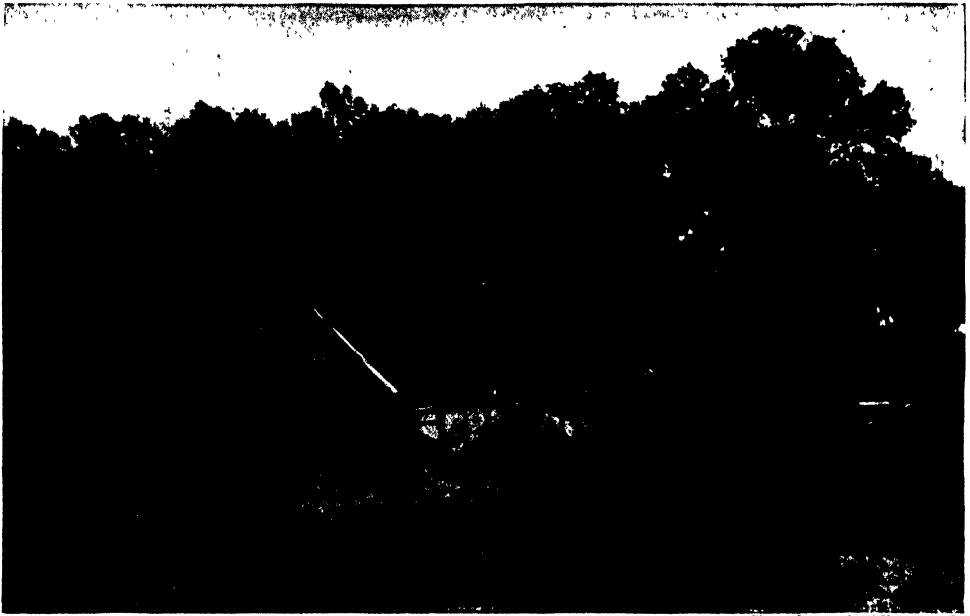
most important towns were Abdera, the birthplace of Democritus; Sestos, on the Hellespont, celebrated in the story of Hero and Leander; and Byzantium, on the peninsula now occupied by Constantinople. Greece is generally supposed to owe the foundation of its music, mythology, and philosophy to Thrace. With the fall of Constantinople, in 1453, the entire region fell under Turkish control.

In 1878, after the Russo-Turkish War, the northern part of Thrace was set off as Eastern Rumelia. The Conference of London, 1913, gave this territory to Bulgaria at the close of the Balkan Wars, but in 1923 the powers awarded Western Thrace to Greece and the remainder to Turkey.

THRASHING, OR THRESHING, MACHINE. This device ranks next in importance to the self-binder among agricultural machines, and since the middle of the nineteenth century, there has been about as much improvement in the one as in the other. The modern thrashing machine is built almost entirely of steel, and is equipped with ball or roller bearings on all the principal shafts. It really consists of a combination of four machines: the thrashing machine proper, which thrashes the kernels of grain from the straw; the separator, which separates the grain, together with considerable chaff, from the straw; the winnowing machine, or cleaning shoe, as it is commonly called, which cleans the grain; and the stacker, which discharges the thrashed straw from the machine up onto a stack. These units are all united into a single frame, which is mounted on wheels so that the machine can be moved from field to field.

The thrashing part of the machine consists of an iron cylinder called the *beater*, to which vertical teeth are attached in rows; and a *concave*, which is a section of a similar cylinder with the teeth on its inner surface. These are so adjusted that the teeth of the cylinder pass very close between the teeth of the concave, and, as the grain passes through between these teeth, the kernels are rubbed out. Just back of the cylinder and what is really an extension of the concave, is the grate, which consists of a series of parallel steel bars spaced about an inch apart, against which the thrashed straw and grain are forcefully thrown. Most of the grain falls through the slots between these steel bars to the grain conveyor below, while the straw passes over the grate on the straw rack, which has a vibratory or shaking motion that shakes out the remaining grain. The straw rack finally discharges the straw at its rear end into a fan, which blows it out onto the stack. In older types of thrashers, the straw was carried on up to the stack by means of an endless belt conveyor, called a *carrier*.

The grain conveyor carries the grain to the winnowing machinery, where the grain is sepa-



THE MODERN THRASHING MACHINE

Photo: International Harvester Co.

rated from the chaff by means of a blast of air, and is then made to pass through a series of screens of different meshes, to remove the inferior kernels and the seeds of weeds. The cleaned grain falls into a cylindrical trough, and a revolving auger in this trough conveys the grain to the side of the machine, from which an elevator takes it to the weighing and measuring device. From this it may be placed in sacks, or loaded into wagons as it comes from the machine.

Most modern thrashing machines are now fitted with what is called a self-feeder. The bundles of grain are thrown onto a wide, endless belt that carries them up to a series of knives, which cut the twine bands. After the bands are cut, the bundles are spread out and fed to the cylinder by various types of mechanism. Formerly, the sheaves were pitched from a stack on each side of the machine to a band table. Two band cutters, one before each table, cut the twine band of the sheaf with a knife. The loosened sheaf was then fed into the cylinder by a man called the *feeder*.

Formerly, steam engines were employed to operate thrashers, and a type that burned straw was very common in the great wheat-growing regions, but these engines are being replaced by internal-combustion motors. The older machines were moved by horse power, but the *combine* is displacing most thrashing machines in the Far West (see REAPING MACHINE). F.W.D.

THREAD, a small twist of two or more strands of cotton, silk, flax, wool, or other fibrous substance, drawn out to some length and

used for sewing. Because of its cheapness, cotton is more extensively used in the manufacture of thread than either silk or flax, and the long-fiber, sea-island variety is the most valuable for the purpose. The supremacy of cotton in this field dates from 1794, when Samuel Slater began the manufacture of cotton thread in Pawtucket, R. I. The credit for the development of the idea which revolutionized thread manufacture belongs to the wife of Slater.

The thread-making process is somewhat complicated. In making cotton thread, after the fibers are cleaned, they are combed in carding machines until the tangles are smoothed out; then they are rolled over and over to form thick coils of soft yarn. These coils are then placed in the drawing frame, where they are passed between sets of powerful rollers; in these rollers, the cotton is drawn out and compressed into thin ribbons. These are fed to another machine, the doubling frame, where they are compressed into fine, delicate strips. Next, the strips are lapped, again drawn out, recarded to eliminate unevenness or other imperfections, and then wound upon bobbins. Several strands are twisted together and re-twisted into a coarse cotton yarn, and this is finally spun by several progressive operations into the finished thread. The latter is either bleached or dyed, and is then wound on wooden spools for marketing. See COTTON; SPINNING.

THRIFT. This word is usually defined as economical management, but, in an older sense, whether applied to plant life, to individual human beings, or to nations, it implies a sub-

stantial and vigorous growth. The word has no exact synonym. Frugality, development, prosperity—each conveys a shade of meaning that is a portion of thrift, but the word means more than any of these, and includes them all.

Thrift is a condition—a condition implying both growth and progress. As applied to the individual, it is a habit that rises to the dignity of a virtue, for it not only adds to the material welfare of those persons who practice it, but it is contributory to the development of a strong and worthy character. We find it embodied in the philosophy of many of the world's most profound thinkers. In Holy Writ, particularly in *Proverbs*, we find definitions of thrift that are applicable to modern times. For example:

He becometh poor that dealeth with a slack hand,
but the hand of the diligent maketh rich.

He that gathereth in summer is a wise son; but he
that sleepeth in harvest is a son that causeth shame.

The rich ruleth over the poor, and the borrower is
a servant to the lender.

Go to the ant, thou sluggard; consider her ways,
and be wise.

Cicero said, "Economy is of itself a great revenue." An old Latin proverb declared, "No gain is more certain than that which proceeds from the economical use of what you have." A couplet from Pope is as follows:

To balance fortune by a just expense,
Join with economy—magnificence.

Shakespeare declared, "Thrift is blessing," and again he said, "I can get no remedy against this consumption of the purse; borrowing only lingers and lingers it out; but the disease is incurable." One definition of thrift was given by John Wesley, who said, "Make all you can, save all you can, give all you can." One of the chief exponents of thrift was Benjamin Franklin, who, through the plain philosophy of "Poor Richard," gave counsel on the value of thrift that will doubtless live as long as American literature is extant.

Simon W. Straus, New York and Chicago banker, president of the American Society for Thrift, and organizer of the modern thrift movement in America, defined this virtue as follows:

Money-saving is not the sum total of thrift. It is only one of the stones in the building of character. Thrift means much more than the saving of money. There is thrift of character; thrift of time; thrift of health, and moral thrift.

A man is not thriftless who spends money, providing he can afford what he spends, and does his duty otherwise to humanity and society. A miser is an undesirable citizen and just as much a menace to humanity as a spendthrift.

Thrift is submission to discipline, self-imposed. Thrift is denying one's self present pleasures for future gain. Thrift is the exercise of the will, the

development of moral stamina, the steadfast refusal to yield to temptation.

Money-saving is only a function; it is thrift in its most elemental sense. But the thrift I preach is thrift in all things, and this is the thrift I hope will be taught in the schools of America. For this is the thrift that will give our beloved nation the type of citizens she will need. From an economic standpoint, thrift is a national necessity.

Andrew Carnegie has emphasized the value of thrift in the following epigram: "The first thing that a man should learn to do is to save his money." From Lord Rosebery we learn that "Thrift is the surest and strongest foundation of an empire, so sure, so strong, and so necessary that no great empire can long exist that disregards it." To the same statesman we are indebted also for the following excellent, comprehensive definition:

Whatever thrift is, it is not avarice. Avarice is not generosity—and, after all, it is the thrifty people who are generous. All true generosity can only proceed from thrift, because it is not generosity to give money which does not belong to you, as is the case with the unthrift; and I venture to say that of all the great philanthropists—all the great financial benefactors of their species, of whom we have any record—the most generous of all must have been thrifty men.

Former President Wilson's idea of thrift was expressed as follows:

If a man does not provide for his children; if he does not provide for all who are dependent upon him—and if he has not that vision of conditions to come, and that care for the days that have not yet gone, which we sum up in the whole idea of thrift and savings, then he has not opened his eyes to any adequate conception of human life. We are in this world not to provide for ourselves alone, but for others, and that is the basis of economy—so that thrift and economy, and everything which ministers to thrift and economy, supply the foundations of national life.

In America, there has been for some time a popular misconception of thrift as applied to the individual. To be thrifty meant, in the minds of many, to be greedy, avaricious, miserly. However, as a result of the work of the American Society for Thrift, organized in 1913 by Simon W. Straus, a truer understanding of thrift became general. Organization of the society followed investigations made in several European countries by Mr. Straus, who received a commission from the United States government, through the Bureau of Education, to conduct these economic researches.

In the European countries visited, he found that thrift was the safeguard of the individual. In the face of a low earning capacity, even among the most poorly paid classes, thrift was practiced and money was saved, thus assuring the individual an income during the periods of unemployment, sickness, and old age; and, in the aggregate, adding greatly to the potential power of a nation. These conditions contrasted

sharply with the profligate ways of the prosperous American, and Mr. Straus, on his return from Europe, began at once the organization of the American Society for Thrift, which collected no funds and had for its purpose a purely educational propaganda.

At an International Congress of Thrift, held in San Francisco, it was decided that the teaching of thrift in the public schools of the United States would lay a foundation for the practice of this virtue by future generations. A committee was appointed to ask the coöperation of the National Education Association, then holding its annual meeting in Oakland. The National Education Association took up the movement and instructed the National Council of Education, a subsidiary body, to prosecute the work. A committee, consisting of members of the National Education Association and the American Society for Thrift, was appointed as the Thrift Educational Committee, and they spent two years in research and investigation.

This committee made a report to the effect that thrift, as a distinct and concrete branch of studies, could not be introduced into the already overcrowded curricula of the American schools, but that, through correlation of those subjects which should exist as the basis of every good curriculum, it could be worked out. A resolution, definitely committing the representative school-body of America to the policy of revising the curricula sufficiently to include a thrift application to many branches, was introduced at a meeting of the National Council of Education by the president of the American Society for Thrift. Having committed themselves to this policy, the school authorities, through a subcommittee, began at once to work out concrete courses of study. While the courses of study will vary with the various grades, the following summary may be taken as the basis upon which the science of thrift instruction is based:

Arithmetic. In the primary grades, problems are given the children for solution which show the value of saving; also the necessity of accuracy, which implies truthfulness. In the intermediary grades, the element of compensation and reward is introduced into the problems, while in the advanced grades, the value of investment is shown. A thrift application must be given to the entire range of mathematical studies, including bookkeeping, accounting, and commercial practices.

English. This branch furnishes opportunities for the teaching of thrift to the children by means of story-telling, compositions, and essays, which include the memorizing of such fables as *The Farmer and the Wheat*, *The Ant and the Grasshopper*, etc. Stories and compositions on the life and works of the industrious insects and animals will show the value of coöperative and individual industry. The specific writing of essays on the subject of thrift will lead the children to research and thought on this subject, without losing any value in diction, grammar, or rhetoric.

Geography. The value of conservation can be taught in connection with this branch. The study of unused lands and wasted water power suggests the necessity of conservation. This also brings in gardening and forestry. The topography of a locality suggests the comparative value of industries and occupations. Domestic and foreign commerce, as well as transportation and trade routes, are rich in suggestion of the principle of thrift.

History and Civics. The value of coöperation may be taught through these branches, as well as through biography. The child may learn that the most successful careers were built primarily on habits of thrift. The lives of successful men, particularly those who have contributed to the substantial upbuilding of America, may be studied with interest and profit. A study of the decline and fall of nations brought about through the improvidence of their people, and a study of the healthful growth of those nations whose people are thrifty, may all be included.

Hygiene. This study suggests cleanliness, sanitation, care of the teeth, home ventilation, proper breathing, abundant use of pure water, care of the sick, emergencies, danger of narcotics. This study should bring out the actual loss incurred through ill health and unhealthful practices.

Domestic Science includes a study of the chemistry of foods, food selection, economic preparation of food, marketing, gardening, and the preservation of food. It also includes sewing, which means the proper selection of fabrics and the saving of clothing through mending, darning, and repairing.

It is suggested that, in communities where thrift is not taught in the schools, parents may adopt plans by which a portion or all of the suggestions in this outline may be given to the child through home instruction. Encouragement of school savings banks is also a wise measure on the part of parents (see subhead under SAVINGS BANKS).

To the individual wishing to take up practices of thrift, it is suggested that a definite record be kept of every penny earned and every penny spent. At the end of the month, go over these items and prepare a budget for the succeeding month, which will, if possible, include the elimination of such expenditures as are considered unnecessary or wasteful. Make it a definite point also to save systematically; lay aside from your earnings a fixed sum daily, weekly, or monthly. Make the amount small enough so that there will not be grave danger of your becoming disheartened. It will be found that the saving habit becomes a most fascinating one, after one has begun it. S.W.S.

THROMBOSIS, *throm bo' sis*. See APOPLEXY.

THROWING THE HAMMER. See HAMMER, THROWING THE.

THRUSH, one of a group of song birds found in all parts of the world. The numerous species include various plain brown birds, with whitish and usually spotted breasts, besides the robins, wheatears, and bluebirds. Thrushes are migratory. They inhabit wooded regions, spending much time on the ground and feed-



Photos: Visual Education Service

O thrush, your song is passing sweet,
But never a song that you have sung

Is half so sweet as thrushes sang
When my dear love and I were young.
—MORRIS: *Other Days*.

From left to right, top and bottom: Wood thrush, hermit, olive-backed, and gray-cheeked thrushes.

ing largely upon insects, thus proving themselves of value to man. They are the highest order of songsters.

The largest and best-known North American species, barring the American robin, is the *wood thrush*, which has bright-cinnamon upper parts, and conspicuously spotted breast and sides. It is noted for its clear, flutelike songs. The wood thrush nests in the Eastern United States and Southeastern Canada, and winters in Central America. Its nest, built on the horizontal branch of a bush or tree, consists of leaves, twigs, etc., closely woven together, and having an inner wall of mud and a lining of fine rootlets. The eggs, which range from three to five in number, are of a greenish-blue color.

Other common species are the *Wilson thrush*, or *veery*, the *hermit thrush*, and the *olive-backed thrush*. In Europe the commonest members of the thrush family are the *redbreast*, or *English robin*, the *throstle*, or *song thrush*, the *English blackbird*, and the *nightingale*, the sweetest singer of all. See BLUEBIRD; NIGHTINGALE; ROBIN. D.L.

Scientific Names. The thrushes belong to the family *Turdidae*. The wood thrush is *Hylocichla mustelina*; the Wilson, *H. fuscescens*; the hermit, *H. guttata*; the olive-backed, *H. ustulata*.

THRUSH, also called **SPRUE**, or infantile sore mouth, is a contagious disease of infants. It is caused by a fungus, and appears in the form of small, roundish, white patches, called *aphthae*, on the lining membrane of the mouth

and throat, and also on the tongue. These patches are slight elevations of the outer layer of the mucous membrane; they cover drops of watery fluid, and contain the fungous growth. When they peel off, a raw, red surface is left. As fresh patches continue to appear, the mouth becomes sore, and suction is painful for the infant. At the onset, thrush is usually accompanied by fever, colic, and diarrhoea. The disease usually runs for about ten days. It rarely occurs in infants of normal health, and is dangerous only when the aphthae become gangrenous. Preventive treatment requires absolute cleanliness of nipples and nursing bottles, with sterilization of milk and other food. On the appearance of the aphthae, the mouth may be thoroughly, but gently, washed with a solution of boracic acid, potassium permanganate, or other mild antiseptic.

THUCYDIDES, *thu sid' ih deez*, a Greek historian of the fifth century B.C., celebrated as the first to write from a critical standpoint. His great masterpiece, *A History of the Peloponnesian War*, has been divided into eight books, the last of which concludes abruptly and bears evidence of not having been carefully revised. The narrative covers twenty-one of the twenty-eight years of the war, the period from 431 to the middle of 411 B.C. It is a terse, impartial record of the conflict, and a striking testimony to the author's painstaking efforts to present accurate information. As the events are given according to the record of each summer and winter, they are not always properly grouped, but on the whole the history is one of the best available sources of information on that period. The author is admired for his skill in analyzing character and his ability to show the relation between cause and effect.

Thucydides was born in Attica. His father, Olorus, belonged to an aristocratic and wealthy family, which was the possessor of rich Thracian gold mines. During the Peloponnesian War, in 424 B.C., Thucydides was in command of part of the Athenian fleet, but his failure to relieve the siege of Amphipolis made him an exile for twenty years. He returned to Athens in 403 B.C., shortly after the close of the war, and it is supposed that he died two or three years later.

THUGS, from the Hindustani *thag*, meaning a *cheat* or *rascal*, was the name first applied to a religious society in India which was in effect a confederacy of professional assassins. The

thugs committed murders and plundered victims in honor of Kali, the Hindu goddess of destruction, and wife of Siva (which see). According to legend, they formerly believed that Kali assisted them in disposing of the bodies of their victims by devouring them, but when one of the fraternity became curious and pried into the proceedings of the goddess, she became angry and condemned them in the future to bury their victims. They frequently murdered by strangling. The native Indian and the English governments joined in efforts to suppress thuggee—the practice of the thugs—at various periods, and in 1831 the British authorities adopted strenuous measures to put an end to the evil. It is now practically wiped out.

Use of the Word To-day. In America, a thug is a "hold-up" man, or highwayman, or a so-called "gunman." The connection between these modern individuals and the traditional Indian character is based on the fact of their common mercilessness.

THULE, *thu' le*, or, more commonly, **ULTIMA THULE**, the name usually given in ancient literature to the most northern of habitable or known lands. Some writers say that Norway or Iceland was meant; others, that the name was given to the largest of the Shetland Islands. Symbolically, *Ultima Thule* has been used to designate any very distant or mysterious region; also, a remote goal or end, as the *ultima thule* of one's ambition.

THULIUM. See **CHEMISTRY** (The Elements).

THUMB, TOM. See **DWARF**.

THUMB RINGS. See **RING**.

THUN, loon, LAKE OF. See **SWITZERLAND** (Waters).

THUNDER. See **LIGHTNING** (Why Thunder Follows Lightning).

THUNDER BAY RIVER. See **MICHIGAN** (Its Rivers).

THUNDER-PUMP. See **BITTERN**.

THUNDERSTORMS. See **RAIN** (Lands That Always Have Rains).

THURMAN, ALLEN GRANBERY (1813-1895), an American lawyer and statesman, United States Senator from Ohio for twelve years, was born at Lynchburg, Va. His parents having removed to Ohio when he was six years old, he attended the academy at Chillicothe, studied law in his uncle's office, and on admission to the bar, in 1835, became his uncle's partner. He soon entered politics, and was elected to Congress in 1845, serving one term. Successful at the bar, he was elected judge of the supreme court of Ohio in 1851, and became chief justice in 1854. He was Democratic candidate for governor in 1867, but was defeated by Rutherford B. Hayes. From 1869 to 1881, he served in the United States Senate, and was its recognized Democratic leader. He was a candidate for the Democratic nomination for President in 1876, 1880,



THUCYDIDES

and 1884, and in 1888 was nominated for Vice-President on the Cleveland ticket, which was defeated.

THURSDAY, the fifth day of the week, literally *Thor's day*, sacred to the ancient Scandinavian or Teutonic god of thunder. This is probably a translation of the Latin *dies Jovis*, meaning *Jove's day*, Jove or Jupiter being the corresponding Roman god. In the United States, the last Thursday in November is celebrated as Thanksgiving Day. Maundy Thursday, also called Holy Thursday, is the day preceding Good Friday. See **THOR**; **WEEK**.

THWAITES, *thwayts*, REUBEN GOLD (1853-1913), an American historian, born at Dorchester, Mass. He removed to Wisconsin in 1866, and attended high school, but his college work, in preparation for a postgraduate course at Yale, he did by himself. In 1876 he was made managing editor of the *Wisconsin State Journal*, at Madison. From 1886 until his death, he was secretary and superintendent of the State Historical Society of Wisconsin, and editor of its publications. Besides his part in making the Wisconsin State Historical Society efficient beyond those of many other states, his greatest work was the editing of the seventy-three volumes of *The Jesuit Relations*. This is considered by authorities one of the most excellent examples of scholarship ever shown by an American historian.

Historical Books. Among his published volumes are *Down Historic Waterways*; *The Story of Wisconsin*; *The Colonies, 1402-1750*; *On the Storied Ohio*; *Stories of the Badger State*; and biographies of Daniel Boone, Marquette, and George Rogers Clark.

THYLACINE, *thy' lah sin*. See **TASMANIAN WOLF**.

THYME, *time*, a fragrant garden herb belonging to the same family as the mints, cultivated in gardens as a flavoring. Its scent is due to an oil contained in the leaves and stems, from which is prepared the drug thymol, used as a remedy for intestinal troubles and for hookworm disease. The plant grows from six to ten inches high, and has square, hairy stems, narrow leaves, and small lilac or purplish flowers, borne in separate whorls. A variety known as *creeping thyme*, with woody, branching stems, makes an admirable cover for rocks and waste places. There is an old tradition that, at midnight in midsummer, the king of the fairies and his followers frolic in beds of wild thyme. Oberon, king of the fairies in Shakespeare's *Midsummer Night's Dream*, says:

I know a bank whereon the wild thyme blows,
Where ox-lips and the nodding violet grows. B.M.D.

Scientific Names. These plants belong to the family *Menthaceae* (or *Labiatae*). Garden thyme is *Thymus vulgaris*; wild thyme is *T. serpyllum*.

THYROID. See **GLANDS** (Ductless Glands); **CHILDHOOD**, **BEHAVIOR IN**; **ZOOLOGY** (How Zoölogy Affects Human Welfare).

THYROID CARTILAGE. See **LARYNX**.

THYSANOPTERA. See **INSECT** (Classification).

TIAN-SHAN, *te ahn' shahn'*, OR **TIEN-SHAN**, *te en' shahn'*, **MOUNTAINS**, a mountain system of Central Asia, commencing in Russian Turkestan and extending nearly 1,500 miles in an easterly direction to the Desert of Gobi. It is closely connected with the Altai system, and divides the watersheds of Lake Balkash and the Terim River. The system consists of a series of ranges running parallel to each other, with a breadth of about 200 miles. The highest peak is Khan-Tengri, rising 24,000 feet above sea level.

There are numerous roads and passes over the mountains, connecting China, West Turkestan, and Persia. These routes are extremely dangerous in winter, owing to snow and ice. All peaks 11,500 to 12,500 feet above sea level are snow-clad, and have numerous glaciers many miles in extent. The mountains contain vast mineral wealth, almost entirely undeveloped.

TIBBUS, *tib' ooz*. See **SAHARA**.

TIBERIAS, *ti be' ri' as*, **SEA OF**. See **GALILEE**.

TIBERIUS, [TIBERIUS CLAUDIUS NERO CAESAR] (42 B.C.-A.D. 37), the second Roman emperor, the son of Tiberius Claudius Nero, an officer under Julius Caesar, and Livia, who afterward was the wife of Augustus. His mother used her powerful influence to secure the advancement of Tiberius and his younger brother Drusus, and the former won considerable distinction in the army, carrying on successful campaigns in Germany and Gaul. Tiberius was compelled by Augustus to divorce his wife, Vipsania Agrippina, to whom he was devoted, and to marry Julia, the emperor's daughter. For a time after this, he lived in seclusion at Rhodes, but he returned in A.D. 1 and again took charge of the army. Although he had no affection for Tiberius and felt little confidence in him, Augustus adopted him and designated him as his successor, Drusus, the emperor's favorite stepson, having died in the meantime.



TIBERIUS

Augustus, lacking a male heir, first adopted his younger stepson, Drusus, who died 9 B.C., owing to a fall from his horse. In A.D. 4, he adopted Tiberius, and was succeeded by him as emperor in A.D. 14. [From a bust in the Museo Nazionale, Naples.]



Photo: Visual Education Service

AN ISLAND IN THE TIBER, IN THE CITY OF ROME

Like so many of his successors, Tiberius at first governed well. Throughout his reign, all the provinces of the empire were especially prosperous. In Rome, however, he showed a growing suspicion of possible rivals, and increasing cruelty. Spies were stationed everywhere, to report any opposition to the emperor, and all who were even under suspicion were punished with death. Postumus Agrippa, grandson of Augustus; Germanicus Caesar, the popular nephew of Tiberius; Tiberius' own son, Drusus Caesar—all were put to death because the emperor feared them; and his own death at Capri, at the hands of Macro, was but the final act of violence of the reign.

Tiberius was a man of undoubted genius, clear of judgment, tenacious of purpose; but he was cold, unloving, and fond of shrouding all his acts in mystery. Thus he became hated by the people, although his strict economy kept taxes low; and the accounts of him which remain are doubtless darker than his real character would warrant.

Named in the Bible. Tiberius is mentioned once in the Bible, and the fact serves as a connecting link between so-called Scripture and profane history of the period. In *Luke* III, 1-3, is the statement that, in the fifteenth year of Tiberius, the word of God came to John the Baptist. It is known from other sources that John was then about thirty years old and that Jesus was only six months younger; this mention therefore serves as important data for determining the time of the birth of Christ.

A Reference. For the part played by Tiberius in the line of emperors, see *ROME* (History).

TIBER RIVER, the historic stream on which lies the city of Rome. In ancient writings, it was frequently called "Father Tiber," suggesting the affection with which the Romans regarded it. It was also known as the "Yellow Tiber," referring to the color of the water, whose swift current carries downstream great quantities of sand and mud. This sediment, deposited century after century at the mouth of the river, has built up the land until, at the present time, the harbor is four miles farther out than in the days of ancient Rome.

The Tiber is the second largest river of Italy, ranking next to the Po. It rises in Tuscany, in the Apennines, 4,160 feet above sea level, and after a winding course of 253 miles, empties into the Tyrrhenian Sea (an arm of the Mediterranean), about twenty-six miles below Rome. It enters the sea by two branches, one of which is a channel excavated by the Emperors Claudius and Trajan. These two arms surround an island known as the Isola Sacra. Under normal conditions, the river is navigable for small steamers as far as Rome. In times past, the Tiber has frequently overflowed its banks; the flood of 1900 caused great devastation. Since then, costly embankments have been constructed at Rome. The river drains an area of 6,719 square miles.

TIBESTI, *tih bes' te*, a mountain range in the Sahara (which see).

TIBET, *tih bet'*, OR **THIBET**, a country of Central Asia which has long been nominally a part of China, but which in reality possesses



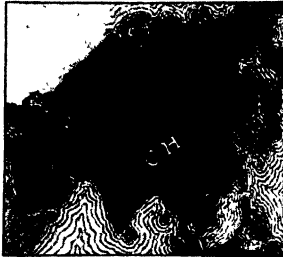
Photos: Visual Education Service; O R O G

Cheerful Tibetans in a Dreary Land. At top, a typical family of Tibet. Below, left, a girl in holiday attire; right, the same girl showing headdress, consisting of a length of sheep's wool, with skin, woven into her hair on each side of her head. The ornaments on the strip of leather are turquoises, which represent her savings.

an almost independent government. It has been aptly called "the roof of the world," for it is the most elevated large area on the globe. It is as large as that part of the United States east of the Mississippi River and north of Tennessee; however, because of physical conditions, the country contains fewer inhabitants than the single state of Massachusetts, the population being probably less than 3,000,000. The inhabitants call their country Bod, or Bhöt.

The maps accompanying ASIA, in these volumes, tell at a glance something of the story of Tibet.

At the south, the Himalaya Mountains send upward the tallest peaks in the world. On the north and north-west, the Kuen-lun range ascends to a height of 20,000 feet. Enclosed thus on three sides by towering walls, the table-lands of Tibet have an



LOCATION MAP

Tibet comprises a large but comparatively unimportant part of China. It is shown in the solid black area.

average elevation of fully 16,000 feet. The Brahmaputra River, in Tibet called the Tsanpo, flows over a thousand miles eastward, to find its Indian outlet to the sea.

The People. The very small population is explained in large measure by the foregoing facts; also, the mountains limit the rainfall to a very few inches a year, so that thousands of square miles are a dreary expanse of sand and gravel, over which violent winds blow at all seasons. There are hundreds of lakes, but they are in dreary surroundings, and most of them are salty, because of absence of rain.

The people have not been greatly influenced by their surroundings, for they are a cheerful and pleasure-loving race, especially fond of theatrical entertainments and horse-racing.

Their Religion. Tibetans are very religious; they profess Lamaism, an offshoot of the Buddhist faith. Raising large families and increasing the number of households is a serious matter, because of the difficulty of making a living, so thousands of young men become monks and lead a celibate life in monasteries. The monks are called *lamas*, and Tibet holds half a million of them.

Among the people who marry, the system called *polyandry* exists; one woman will often marry from two to half a dozen men—usually all the brothers of one family. The average number of husbands is three. The wife may dismiss a husband at will, and a discarded mate is thereafter an outcast from society. Tibetan

men, it is said, are beginning to protest strongly against domination by women. The latter are prominent in the management of shops and general retail trade.

The Capital. The only city of importance is Lhasa, the capital.

Lhasa, lah' sah, is the holy city of the Tibetans, and is also known as "the Forbidden City," because its sacred temples have always been guarded zealously from white people; only two or three Caucasians, until recently, have ever entered it. Lhasa proper is a closely packed assemblage of stone and brick dwellings and shops, interspersed with many temples. About fifteen monasteries are scattered through the suburbs and over the plains. The curiously constructed houses have low, flat roofs and no chimneys; paper, oiled or plain, serves for windows. At night, light is furnished by torches or primitive lamps fed with vegetable oil. The women stain their faces with black spots. Besides being a great religious center of the Buddhist faith, Lhasa is important as a trading center, being the terminus for caravans to and from India, Kashmir, Burma, China, Mongolia, and Turkestan. Tea, silks, carpets, rice, and tobacco are the chief articles of commerce. The resident population, not including the garrison and the monks, is about 15,000, although this number is greatly increased by a floating population of pilgrims and traders, making the total population from 40,000 to 80,000.

Resources. It is possible to live but a few months of the year in the high altitudes; while there, the people raise sheep and yaks, and these they drive lower down, when the short, warm season is over. In the valleys there is vegetation, but it is not plentiful enough to meet the demands of the population. Barley is the staple crop, for it will grow in cooler climates than any other grain except rye, and it is the principal foodstuff. There is some mining, gold, silver, iron, and copper being found.

Europeans Excluded. During the nineteenth century, Europeans were practically prohibited from entering the country, and were speedily expelled if found within it. Some explorers, however, succeeded in visiting some districts, and one of these, W. W. Rockhill, an American, added largely to the world's knowledge of Tibet and its people. Since the World War, English representatives from India have been welcomed in Lhasa.

Government and History. Because it is inaccessible, Tibet is difficult to govern from Peking or Nanking, especially in view of the opposition of the people to China. The civil and religious authority is the *dalai lama*, or *grand lama*, who rules from Lhasa. For years the Chinese government has worked steadily to bring Tibet under control of China, but Chinese authority is felt but slightly in the country, and the people appear to care little what happens to the remainder of China; indeed, they have practically maintained independence since 1912. Although the dalai lama



Photos: O R O C; Visual Education Service; O R O C

In Unattractive Tibet. At top, a villager making a goats' hair blanket for the relentlessly cold winters (even in summer the nights are cold). Center, a village in Western Tibet. Below, yaks, beasts of burden, in a courtyard of an inn.



RESIDENCE OF THE RULER OF TIBET

The most splendid structure in the country is the home of His Highness, the Dalai Lama, in Lhasa, the holy city of Tibet. Clustered near the foot of the hill on which the royal palace stands are homes of rich Tibetans. There are few of these, nearly all the people live lives of hardship.

and his ministers were forced to flee to India in 1910, the Tibetans were successful in 1912 in keeping the Chinese troops out of Tibet. In 1913 the Chinese attempted to negotiate with the Tibetan government. The Tibetans demanded that a British representative be present at the conference. The agreement drawn up was refused by China, but hostilities were suspended, pending renewal of the negotiations.

Fighting was renewed in 1917, and the Tibetans succeeded in capturing territory as far east as the Yangtze River. In 1918 a truce was signed, and Tibet retained the territory gained. Through 1919 and 1920, the Chinese government's proposals for renewal of negotiations were unsuccessful. In 1922 Tibet installed a telegraph system uniting Lhasa with the Indian system. The dispute with China was opened again in 1926 by the Tibetans, who apparently want a settlement which will assure their independence. Unsettled conditions in China have prevented developments of any nature. E.D.F.

Related Subjects. In connection with this article, the reader may refer to these topics in these volumes:

Brahmaputra River
Himalaya

Kuen-lun Mountains
Lamaism

TIBIA. See ANT (Parts of an Ant); also illustration, under SKELETON.

TICAL, *tih kahl'*, a standard coin in Siam. See MONEY (Foreign Monetary Standards).

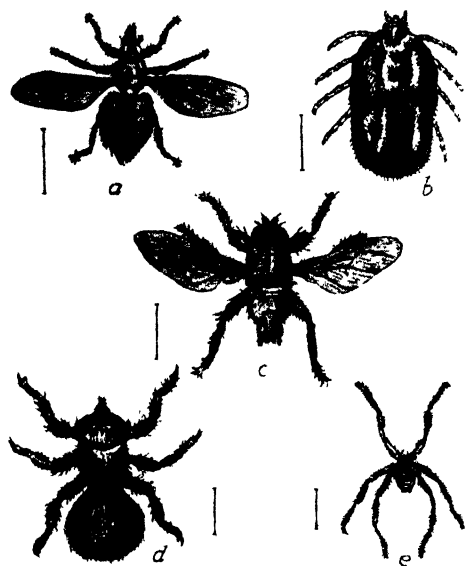
TIC DOULOUREUX, *tik doo loo roo'*, a French term meaning *painful twitching*, is the name of an acute form of facial neuralgia. There are usually shooting pains on one side of the face, which last only a few moments, but recur frequently. Warm applications or electrical treatment with iodides will sometimes relieve the pain. Real cure depends on finding the cause. Facial neuralgia often originates in diseased teeth or tonsils, or is due to an infected area elsewhere in the body. Another possible cause is pressure on a nerve, producing pain by reflex action. Persistent neuralgias require a thorough examination by a competent physician. See NEURALGIA. W.A.E.

TICINO, *te che' no*, the ancient name of Pavia. See ITALY (The Cities: Pavia).

TICINO RIVER. See SWITZERLAND (Waters).

TICK, an oval-shaped parasitic animal belonging to the same class as mites, spiders, and scorpions (see ARACHNIDA). With mites (which see), the ticks form an order of arachnids of great economic importance, for they are responsible for various diseases of men and domestic animals. Ticks are chiefly injurious because they often carry in their bodies certain disease germs which they transmit to the blood of their victims. Sometimes the bites of ticks are in themselves poisonous, and cases of paralysis are known to have followed their attacks, but such effects are not very common.

Ticks and mites are much alike in body structure, the name *tick* being applied to the larger species of the order (*Acarina*). Most of the forms called ticks may be seen without a glass, even in the larval stage. Many of the mites are microscopic. Ticks live only on animal fluids, but some of the mites feed on plant juices and tissues, and on plant products. The



TICKS

The illustrations show ticks found on (a) birds; (b) cattle; (c) horses; (d) sheep; (e) bats. The perpendicular lines indicate actual adult sizes. All except b are shown in their immature stage, when they have but six legs.

bodies of these arachnids are seemingly all in one piece, though in some species a groove is found between the abdomen and fore part of the body. Ticks have a movable process at the anterior end that serves as a head. The blood of their victims is drawn through a beak equipped with strong recurved teeth that enable the parasites to cling to their hosts most tenaciously. In the adult form, the ticks have eight legs, extended sidewise in the manner of a crab's.

The males and females mate on the bodies of the animal hosts, but only the female sucks blood. Her flat, six-legged larvae are hatched from eggs laid in dead leaves or other ground rubbish. The larvae alight on passing animals from grass stalks and shrubs, and after gorging themselves with blood, with which they become greatly distended, they cease to eat, molt, and are changed into eight-legged nymphs. After another molting, the nymphs are transformed into adults, capable of reproduction. In some species, the larvae and nymphs drop to the

ground to undergo each change of form, and the female always does so to lay her eggs.

Kinds of Ticks. While the various species are given special names, as *cattle*, *dog*, or *sheep* tick, very few are restricted to one kind of host, and many that attack animals are also annoying to man. There are eight species that are pests on cattle in the United States (see **CATTLE TICK**).

In the Northwestern states, a disease of man called *spotted fever* and *Rocky Mountain fever* is transmitted by *Dermacentor venustus* and related species (spotted-fever ticks). *Argas persicus*, the mian bug of Persia, infests houses and is said to kill human beings with its bites. It also carries disease germs to poultry, and is identical with certain species that are common pests of poultry in the Southwestern states. The common English sheep tick, *Ixodes ricinus*, also infests dogs and cattle. This and related species are found in America.

Persons walking and camping in the woods are often troubled by *wood ticks*. If these pests are pulled out forcibly, the toothed beak will be left inside the flesh, and possibly cause a festering sore. The best way to get rid of the intruders is to drop gasoline, kerosene, or chloroform on them, whereupon they will loosen their hold and come out easily. S.H.S.

TICKER. See **STOCK TICKER**.

TICKWEED. See **PENNYROYAL**.

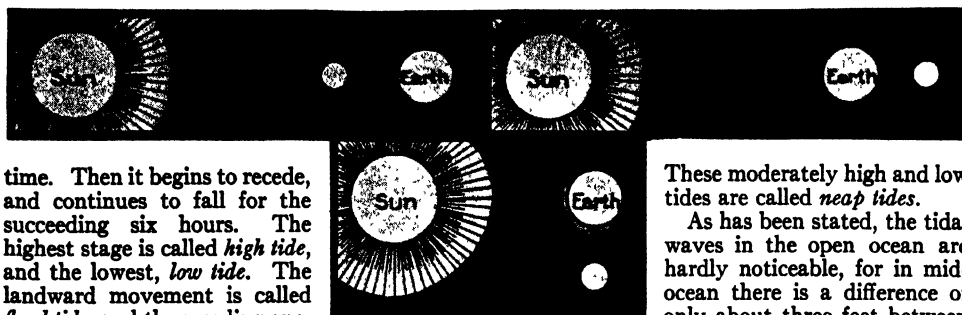
TICONDEROGA, *ti kon dur o' gah*, **BATTLE OF.** See **REVOLUTIONARY WAR**; **ALLEN, ETHAN**.

TIDAL AIR. See **BREATH AND BREATHING** (Lung Capacity).

TIDAL RACE. See **TIDES**.

TIDES, the periodic rise and fall of ocean waters, observed on most seacoasts twice a day. Centuries ago, before many of the familiar facts of astronomy and physical geography were known, these daily movements of the ocean were watched with awe; the reason for the phenomenon was eagerly sought by the wise men. It was a problem, however, that baffled philosophers until the seventeenth century, when Sir Isaac Newton furnished the key to the solution, with his theory of gravitation. According to this principle, every particle of matter in the universe during every instant of time is attracting every other particle. Tides are caused by the attractive force of the sun and moon, as it is exerted on the earth. That is, these bodies pull upon the earth in such a way as to cause a piling up of the water envelope; the effect on the solid earth is, of course, not discernible, for the land envelope acts as a rigid body and does not perceptibly yield to the pulling force, although the force is present. It is constant and unalterable. While Newton's explanation of gravitation has been called into question by Einstein (see **EINSTEIN'S THEORY OF RELATIVITY**), the theory as applied to the tides is the most reasonable that any one has put forth.

The course of the daily tide is as follows: There is a gradual rise for about six hours, and then the water remains stationary for a short



CAUSE OF TIDES

- (1) The attraction of the sun and moon in conjunction; (2) sun and moon in opposition; (3) moon in quadrature.

time. Then it begins to recede, and continues to fall for the succeeding six hours. The highest stage is called *high tide*, and the lowest, *low tide*. The landward movement is called *flood tide*, and the receding one, *ebb tide*. These terms have been applied to the wave movements as observed on shores, for it is difficult to distinguish the tides out in the open sea.

On every portion of a coast, there are two high and two low tides within a little more than a solar day, the average interval between two successive high tides being about twelve hours twenty-five minutes. The hours of high and low tides vary from day to day; they occur at the same hour only once in each lunar month.

According to Newton's laws of gravitation, the sun exerts a greater attractive force on the earth than the moon, because of its immense size (see GRAVITATION). The difference in size between sun and moon offsets the difference in distance, and the sun pulls the earth with 175 times the force that the moon does. On the other hand, the moon has a greater *tide-producing* force. Varying heights of lunar and solar tides are due to the difference between the pull of the moon and that of the sun on the earth's center, and on the portions nearest to and farthest from the center. Since the diameter of the earth is 8,000 miles, the sides of the earth nearest the sun and moon and farthest from them are 4,000 miles nearer to and farther from the sun and moon than is the earth's center. Relatively, of course, this difference of 4,000 miles is much more important in a total distance of 240,000 miles (the moon's distance) than in 93,000,000 miles (the sun's distance). Therefore, since the differential pull of the moon is greater than the differential pull of the sun, the moon's pull raises the greater tides. See MOON.

When the sun and moon are pulling in the same straight line, as at full moon or new moon, the effects of the solar high tide are added to those of the lunar high tide, and the result is a tide higher than the average. Such waves are called *spring tides*. At the same time, there is a corresponding low ebb tide. When the sun and moon act at right angles, the solar high tide occurs at the same point as the lunar low tide, and prevents the latter from being as low as usual; the solar low tide, on the other hand, lessens the force of the lunar high tide.

These moderately high and low tides are called *neap tides*.

As has been stated, the tidal waves in the open ocean are hardly noticeable, for in mid-ocean there is a difference of only about three feet between high water and low water. On seacoasts, the height of the tides varies greatly, because of the varying shape of the shores.

When the tidal wave enters a wide-mouthed channel or estuary converging inland, the waters pile up as they pass the narrowing shores, and a rushing stream, called a *bore*, is formed. In the Bay of Fundy, the tidal wave sometimes reaches a height of fifty feet. Bores also occur in the Amazon, the Ganges, in numerous estuaries of the British Isles, and in other places. Such tides are often very dangerous to shipping. Another phenomenon of tide waves is the *tidal race*, formed when the tide rises to different heights in two bodies of water joined by a narrow channel. Sometimes the force of such a current renders navigation very dangerous.

Tides are of value in keeping the otherwise stagnant waters of bays and harbors in movement. Large steamers usually leave port at high tide; some landlocked harbors have so shallow an entrance at low tide that all vessels must wait for the flood, before they can pass over the bar. Mariners' charts, which show the variations in tide for all harbors, are compiled for the convenience of navigators, and these are carried by all tidewater vessels. R.H.W.

[An illustration of the use to which man may put the flow of tides is given in the article FUNDY, BAY OF.]

TIE, in music, the name given to a slightly curved line which connects two like notes or tones. They are then played or sung as one. Ties connect notes on the same degree of the staff. A line connecting notes on different degrees is called a *slur*. For further details, and illustrations of tie and slur, see MUSIC (Ties and Slurs).

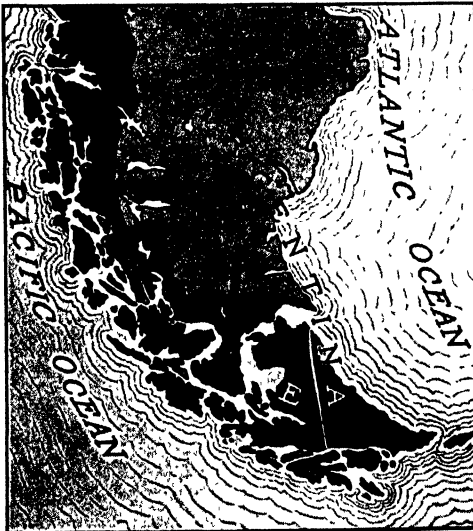
TIEN-TSIN, *te en' tseen'*, a Chinese city in the province of Chi-li, first opened to foreign trade and settlement by a treaty negotiated in 1860, and now, next to Shanghai, the most important seaport. It lies on the Pei-ho, where that river meets the Grand Canal, and is about seventy miles southeast of Peking (Peiping). The native city, as well as the foreign settlement, suffered severely during the Boxer Re-

bellion, in 1900; afterward, the city walls were razed and the municipal services considerably improved. The foreign settlement, which is known as Red Bamboo Grove, is a modern city, with a fine driveway along the river, good streets, gas and electricity, attractive homes and public buildings, and schools, hospitals, and clubs. This section is situated about a mile and a half below the Chinese city, and is the center of important business interests. Estimated population, 900,000.

Tien-tsin has railway connections with Peking, the coal district of Kaiping, Manchuria, and Hankow. The import and export trade is very large, with both foreign and domestic ports. Exports include straw braid, furs, hides, camels' wool, tobacco, wood, and coal; the imports are chiefly woolen goods, jeans, sugar, rice, grain, petroleum, tea, opium, paper, steel, and salt.

TIERCE, *teers*, a term in fencing (which see).

TIERRA DEL FUEGO, *tyehr' rah del fwa' go*, an island group lying off the southern extremity of South America, from which it is separated by the Strait of Magellan, on which is the world's southernmost city, Magallanes (until 1920 Punta Arenas), with a population of 10,500. The archipelago was discovered in



TIERRA DEL FUEGO

1520 by Magellan. These islands have a total area of about 28,000 square miles, but over four-fifths of this territory is included in the area of one large island, sometimes known as King Charles South Land, but more generally as East Tierra del Fuego. The archipelago is divided politically into two sections, one the possession of Argentina and the other of Chile. The Argentine portion, 8,500 square miles, consists of the eastern part of the main island

and Isle de los Estados, or Staten Island, an isolated island on the extreme east. The western part of the large island and the rest of the archipelago, 19,500 square miles, belong to the Chilean Territory of Magallanes.

The small islands constituting the Chilean division end at the extreme south in Horn Island, on the southern end of which is the famous cape called by sailors "the Horn." See HORN, CAPE.

TIERRAS CALIENTES, *kahl yen' taze*. See MEXICO (Climate).

TIFFIN, OHIO. See OHIO (back of map).

TIFLIS, *tye flyees'*. See GEORGIA (Transcaucasian Socialist Federated Soviet Republic).

TIGER, a lithe, beautifully marked jungle cat of Asia. For strength and fierceness, it has only one rival, the lion; while for cruelty and treachery, it probably has none. Rudyard Kipling, in his *Jungle Books*, makes a scarred tiger, Shere Khan, the outlaw of the jungle; he killed not only for need of food, but also for love of blood, and was feared by all the other animals for his viciousness and cruelty, and despised for his treachery. Though the story is highly imaginative, it probably presents a fairly accurate interpretation of tiger nature.

Appearance. In size, in the structure of the skeleton, in teeth, and in claws, the lion and the tiger are much alike, but there the resemblance ceases. The tiger has no mane and it cannot roar. Its coat is not dull fawn, but is bright fawn in color, shading to white underneath, and beautifully marked with irregular stripes of black. The largest tigers are found in India; those in Southern Siberia, Turkestan, Persia, China, and Japan, and those on the islands of Java and Sumatra, are smaller. The Indian tiger is sometimes as much as ten feet long from the tip of the nose to the tip of the tail, and its coat is very glossy and brilliant; the tigers of colder regions have a thicker, rougher fur, which is much duller in color.

Habits. The tiger is a carnivorous (flesh-eating) animal. In India its principal food consists of deer, wild pigs, antelope, young buffalo—for even the tiger fears the powerful old bulls—and cattle, to the number of about 32,000 in a year. The terrible "man-eaters," who have been known to kill as many as 130 natives in one year in India, are not the young, fierce beasts, but are old tigers whose first vigor has departed, and whose teeth are so worn that they find men even easier to kill than domesticated cattle. Sometimes a whole district will be deserted if a man-eater invades it, for attempts to destroy tigers by traps, pitfalls, spring guns, or poisoned arrows are not very effective.

The tiger usually hunts at night, unless it is ravenous, on which occasions it becomes extremely bold and will kill in daylight. It will climb trees occasionally, and it swims easily



The Tiger, Unrivalled for Cruelty. The three upper pictures present excellent views of the tiger and one method of bringing down its prey. At the bottom is the saber-tooth tiger of prehistoric times [illustration from American Museum of Natural History, New York].

and readily. It is reported that tigers will even swim from one island to another in search of a better hunting ground. The mother tiger is very affectionate, and often keeps her cubs, from two to six in number, with her until they are nearly two years old. As soon as they can no longer live on her milk, she prowls with them in the jungle, and teaches them to kill for themselves. Once they have learned to provide their own food, the cubs are abandoned by the mother, who may even eat one of them later, when food is scarce.

How Tigers Are Captured. Because tigers have their lairs in the jungle, where the grass and undergrowth are very high and dense, they cannot be successfully hunted on foot. Natives are sent out on foot to "beat" the bush and drive the tigers out of their hiding places into the open, where they are shot by white hunters mounted on elephants. Both beaters and elephants are mortally afraid of the tiger, for even the elephant's thick skin is not proof against the terrible claws of the great cat. This sort of big-game hunting is exciting and dangerous, for a wounded tiger sometimes springs upon the elephant's back to attack the hunters in the *howdah*, or cage. A much safer method is to tether a goat or some other live bait in a place where a tiger may be expected, and then to shoot it from a platform erected on poles or in a near-by tree. Tigers for zoos are caught by nets spread in their paths, or are trapped in grass-covered pits.

The tiger's average length of life is twenty-five years. M.J.H.

Scientific Name.

The tiger belongs to the family *Felidae*. The species found in India is *Felis tigris*. Other forms are usually regarded as varieties or subspecies.

[For illustrations of members of this family, see the article CAT.]

TIGER CAT.

See SERVAL.

TIGER LILY, a tall garden plant, native to Eastern Asia and believed to be the first lily brought to America. It was so named because its reddish-orange blossoms, splashed with black, suggest the color and markings of the tiger. The plant is pro-

duced from bulbs which are used for food in China and Japan. Its greenish-purple or dark-brown stem, often reaching a height of five or six feet, bears alternate, lance-shaped leaves, deeply veined from tip to base. At the point where they join the stalk, tiny black bulblets appear, which cling to the stem for a time, but finally drop off, producing other plants. See LILY.

B.M.D.

Scientific Name. The tiger lily belongs to the family *Liliaceae*. Its botanical name is *Lilium tigrinum*.

TIGLATH-PILESER, *pih le' zur*, according to the Old Testament, the name of several Assyrian kings.

Tiglath-Pileser I, whose reign began about 1120 B.C., was a powerful ruler. He made conquests in Northern Syria, Cappadocia, Persia, Armenia, and Kurdistan, and even entered the city of Babylon. Much of his time was occupied in constructing palaces and temples and beautifying his capital city of Assur, on the Tigris River. The next king of the same name ruled about 950 to 930 B.C., as Tiglath-Pileser II.

Tiglath-Pileser III, the most important of the name, was remarkable for his power, and ruled over Assyria from 745 to 727 B.C. He assumed the name of the famous conqueror of earlier times, his original name being Pul, or Pul. Being an able political organizer, as well as a successful general, he gained the good will of the Babylonians by checking near-by tribes that had been troubling them, and by establishing Assyrian colonies in hostile territories, thinking that a more profitable scheme for gaining control than the ordinary methods of invasion by force. Frequent revolts in Northern Syria occupied much of his time. Events connected with the assistance he lent to Ahaz, king of Judah, in conquering Damascus are chronicled principally in the fifteenth and sixteenth chapters of *II Kings*, where both the names, Pul and Tiglath-Pileser, appear. In 728 B.C., he was crowned king of Babylonia, but died the following year, leaving the empire to his son, Shalmaneser IV.

TIGRIS RIVER. With its sister stream, the Euphrates, the Tigris formed the ancient valley of Mesopotamia, now Iraq, in Asiatic Turkey. Within this valley, according to tradition, was located the Garden of Eden, and on one of the heights northeast of this valley, the Ark of Noah is said to have rested. In Assyria and Babylonia, in the southern part of the Tigris-Euphrates basin, there developed two great civilizations of the ancient world, both of which flourished long before Greece and Rome came to power. The ruins of the ancient city of Nineveh, capital of Assyria, lie on the left bank of the Tigris, opposite the modern town of Mosul (see NINEVEH).

The Tigris rises from two main sources, which drain the region south of the Taurus Mountains. The main stream follows a winding, southeasterly course through the modern kingdom of Iraq, to Garmat Ali, and at this point unites with the Euphrates. The sister rivers



THE TIGER LILY



Photo: U & U

On the Tigris. The peculiar round basket-boat is called a *kufas*. People, animals, and freight of all kinds are carried in it across the river or downstream; it is not successfully paddled upstream when loaded.

then flow as one—the Shat-el-Arab—to their mouth on the Persian Gulf, seventy miles beyond. Formerly, the town of Korna, thirty miles above Garmat Ali, was the junction point, but the channel of the Tigris has been undergoing a change for many centuries. The total length of the Tigris is about 1,150 miles. It is navigable for steamers to a point about thirty miles south of Mosul, near the mouth of the Great Zab, but, in general, it presents great difficulties to navigation, the upper Tigris being navigable only for native rafts. The river flows over a bed of clay, sand, or conglomerate, and is full of obstructions. See EUFRATES RIVER.

TILDEN, SAMUEL JONES (1814-1886), an American lawyer, statesman, and philanthropist, the opponent of Rutherford B. Hayes in the most closely contested Presidential election in the history of the United States. He was



Photo: U. S. U.

SAMUEL J. TILDEN

born at New Lebanon, N. Y., and was educated at Yale College and at the University of the City of New York. He was admitted to the New York bar in 1840, and rapidly gained success. For two successive years, Tilden was a member of the State Constitutional Convention, and he served two terms in the New York legislature. Tilden figured prominently in exposing the graft and frauds of the famous Tweed Ring; he gained such popularity that he was elected governor of New York (1875-1876), and was the Democratic nominee for President in 1876.

In this election, there were said to be frauds in the elections of South Carolina, Florida, and Louisiana, and the settlement of the question by an electoral commission appointed by Congress resulted in a vote of eight to seven, in favor of Rutherford B. Hayes, Tilden's opponent. In 1880, and again in 1884, Tilden was offered the Presidential nomination, but he refused it on both occasions. The greater part of his fortune, estimated to be \$5,000,000, was bequeathed as a foundation for a public library in New York. The will was contested, and only about \$2,000,000 was used for the purpose.

Related Subjects. For details of the Tilden-Hayes episode, the reader is referred in these volumes to **ELECTORAL COMMISSION**. See, also, **TWEED, WILLIAM M.**; **HAYES, RUTHERFORD B.**

TILEFISH, a species of deep-sea fish first discovered in 1879 by fishermen engaged in cod trawling near Nantucket. These fish were seen again in 1880 and in 1881, and specimens were examined with great interest by the United

States Fish Commission, which reported their flesh to be excellent food. Large specimens are about three feet long and weigh about thirty pounds. The species was almost exterminated in March and April of 1882, when immense numbers of dead fish appeared on the surface



THE TILEFISH

of the water south of Long Island. It is supposed they perished in cold-water currents, forced southward by the heavy spring gales of that year. Special efforts were made to find surviving specimens and to propagate the fish, and, as a result, the species has been reestablished and is increasing in numbers. Their food consists preëminently of crabs, though they also eat squid, smaller fish, and mollusks.

The United States Bureau of Fisheries has given considerable publicity to the good flavor and fine texture of the tilefish. Fishing is carried on in dories, small, strong boats which are thoroughly seaworthy, and are carried by larger sailing vessels. Each dory is manned by two sailors, who row it out a mile from an anchored buoy, to which is attached a mile of fishing line having a thousand hooks. A ton and a half is considered an average catch for a sailing vessel. Before they are brought to land, the fish are cleaned and packed in ice. L.H.

Scientific Name. The tilefish is named *Lopholatilus chamaeleonticeps*, which means *crested tilus with a head like a chameleon*.

TILES, flat, curved, or tubular pieces of baked clay, glazed or unglazed, used for covering roofs, mantels, floors, and walls, as furnace linings, and in the construction of drainage pipes. The processes of manufacture are much the same as those employed for bricks. Coarse, rough clay is generally used in making the tiles for drainage pipes, and the pieces are tubular or semi-tubular. A continuous pipe is made by the overlapping of separate tiles, each of which has an extension at one end, for the purpose of fitting closely to its neighbor. Roofing tiles are of various shapes and colors, and are used very effectively in modern architecture. Wall tiles are made of fine grades of clay, of terra cotta, and sometimes of porcelain. Terra-cotta tiles are now often used as outer wall coverings for buildings, including some skyscrapers.

Very charming effects are attained by the use of tiles of different colors, harmoniously and artistically arranged. *Encaustic* is the trade name for decorative tiles used in such a way that there is a main ground of one color and an inserted pattern of contrasting color. Small, unglazed tiles in plain colors, combined to form a design, are called *mosaics*. White polished tiles are popular for walls and ceilings of kitchens and bathrooms; for the latter, a variety of tints are often employed.

Wall tiles were probably first made in Syria, the Tigris-Euphrates Valley, and Persia. In the latter country, wall tiles, for both exterior and interior use, were made in various centers. Several potteries in Asia Minor still produce wall tiles of traditional Persian patterns and colors, some of which are of exquisite beauty. See MOSAIC; BRICK AND BRICK-LAYING.

TILL. See DRIFT.

TILLMAN, BENJAMIN RYAN (1847-1918), an American politician, born in Edgefield County, S. C. His school days at Bethany Academy, in West Virginia, were interrupted when the War of Secession broke out, and the boy enlisted in the Confederate army. His services were soon ended, however, by a severe illness, which lasted for more than two years and left him blind in one eye. After the war, he became a planter. He soon became a Democratic leader in South Carolina and a champion of technical and industrial education. Perhaps his greatest service to the South was his founding of two technical schools, one for boys, the other for girls, the largest of their kind in the Southern states. In 1890 and 1892, he was elected governor of the state, and in 1895, 1901, 1907, and 1913, to the United States Senate. He became known throughout the country as a fiery speaker and enthusiastic fighter; his attacks on the policies of Grover Cleveland in 1895-1896 gave him the nickname "Pitchfork Ben."



Photo. Brown Bros.

BENJAMIN R. TILLMAN

TILLY, JOHANN TZERCLAES, Count of (1559-1632), a German general who, in the Thirty Years' War, held command of the forces of the Catholic League. Destined for the priesthood, he was educated by the Jesuits, but a military life being more to his liking, he joined the Spanish army about 1574, soon rising to the command of a company, and to a provincial governorship, which he held from 1590 to 1594. Later, he joined the Austrian army in its war against the Turks.

In 1604 Tilly became general of artillery, in 1605 field marshal, and in 1610 was selected by Maximilian, Duke of Bavaria, to reorganize the forces of the Catholic League, which he later commanded in the Thirty Years' War. As commander in chief of the Catholic field forces, he won many notable victories and suffered few early defeats. On August 27, 1626, in conjunction with Wallenstein, he defeated Christian IV of Denmark at Lutter, a marked triumph for the Catholic League.

On September 17, 1631, however, Tilly was completely defeated by Gustavus Adolphus at Breitenfeld; he met the same general in a second battle at the River Lech, in April, 1632, and received a mortal wound, dying three days later. See THIRTY YEARS' WAR.

TILSIT, PEACE OF. See BONAPARTE, NAPOLEON; FREDERICK WILLIAM (III, Prussia); ALEXANDER (I, Russia).

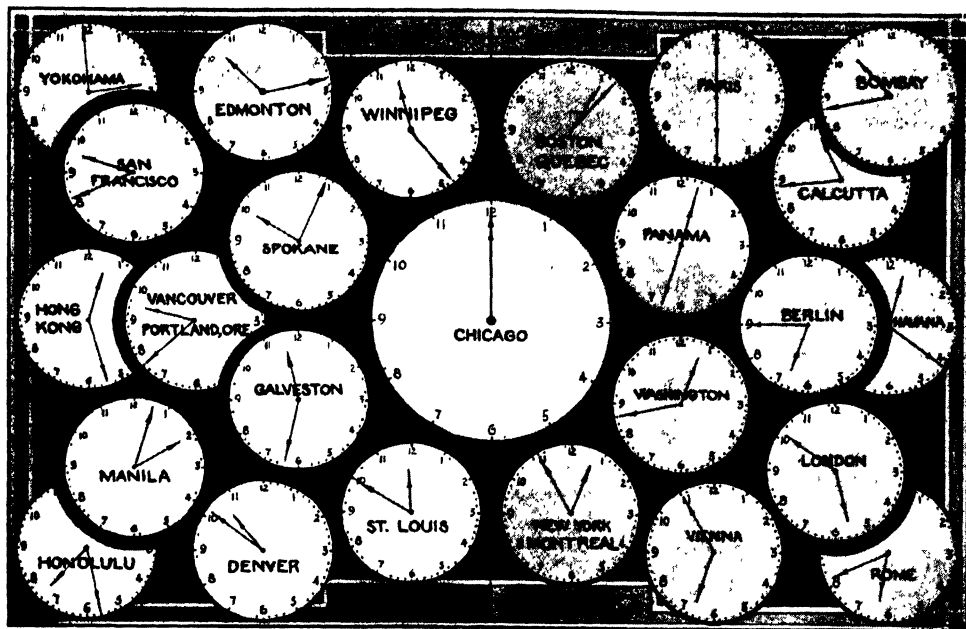
TIMAGAMI, *le mah' gah mih*, FOREST RESERVE. See ONTARIO (Forests and Lumbering).

TIMBER. See LUMBER.

TIMBREL. See TAMBOURINE.

TIMBUKTU, a town of French West Africa, situated near the southern boundary of the Sahara Desert, nine miles north of Kabara, its port on the Niger River. The terrace on which it lies is surrounded by dreary stretches of sand and marshy hollows, and the vicinity has been called "the meeting point of the camel and canoe." The site was settled in the eleventh century by the Tuaregs. Timbuktu is the trading center for merchandise brought from the north of Africa and the regions south and west of the Niger, and vast quantities of goods are exchanged here. Great caravans of 3,000 or 4,000 camels enter the town every year. The items of exchange include gums, rubber, gold, salt, wax, ivory, hardware, cheap fabrics, and beads. The local industries—cotton-weaving and the production of pottery, leather articles, and embroidery—are relatively unimportant.

When the French took possession of the town, in 1804, it was almost wholly in ruins, but under a new régime it acquired schools, European churches, modern streets, fortifications, and other innovations. It is an important Mohammedan center of learning, and contains several mosques and a Moslem library. The natives, however, live in dreary clay huts. In 1923 the surrounding territory was converted into a "Civilian Territory," with local authority. A north-and-south rail line across the Sahara is projected. In 1923 the automobile first reached the city from across the great desert, in the form of the caterpillar tractor. The population is about 7,000, but in the principal trading months, from March to June, it reaches 25,000. See FRENCH SUDAN; SAHARA.



DIFFERENCES IN SOLAR TIME AROUND THE WORLD

When it is noon in Chicago it is earlier or later west and east, as shown on the dials.

TIME. The scientist says that what we call *time* is the duration measured for all things, with a beginning and an end between an eternity past and an eternity future. A man with only the layman's viewpoint defined time in this way: "Dost thou love life? Then do not squander time, for that is the stuff life is made of." A French philosopher declares that time does not exist at all; that the past is gone and is nothing; that the future is something which may never be; and that all we have of duration is the present indivisible instant, which is gone before we can say, "It is here." The German scientist Einstein, whose name is associated with the theory of relativity, says that time cannot be considered apart from space, and that all objects exist in a world of space-time.

These theories of time are interesting, but for practical purposes, mankind is concerned with the generally accepted measurement of time. According to the common conception, any section of time is a period of duration which extends between two events, such as the death of Charlemagne and the discovery of America. For convenience, we divide such duration into smaller periods of specified length, and call them years, months, days, hours, minutes, and seconds.

We base the length of these periods, or time units, on certain astronomical events. The astronomer records the time between two successive positions of a star across a given meridian; such duration is a *sidereal* day. This

unit is the exact time it takes the earth to turn on its axis, but is about four minutes less than twenty-four hours. During the period of a sidereal day, the earth moves on a certain distance in its orbit around the sun, and in order to face the sun again, it has to make just a trifle more than one rotation on its axis. The small bit of time needed for this extra movement gives us our day of twenty-four hours (nearly). Therefore we call the time from one midnight to the next, or from one noon to the next, a *solar* day. By general agreement, the period from midnight to midnight is considered the solar day for practical reckoning.

It is always noon in any place when the sun is directly overhead. Actually then, when it is noon at "Centerville," it is not yet noon at "Bordentown," ten miles west, and it is past noon a few miles east. If there were no adjustment of time reckoning, and each town had its own local, or sun, time, there would be endless confusion. In the United States and Canada, a system of *standard* time has been adopted, whereby the North American continent is divided into parallel zones (Eastern, Central, Mountain, and Pacific), each of which takes the sun time of what is practically its central meridian. All of the clocks and watches in any one belt theoretically show the same time, whatever the hour of the day. Time in belts east, however, is later, while in belts west it is earlier.

Time corrections for the United States are made at the Naval Observatory at Washington, D. C. By means of an instrument called a *meridian circle*, the exact moment is determined when a star is directly in a north or south line. Every day at noon, and at 10:00 o'clock at night, Eastern Standard Time, signals are sent to all parts of the nation by telegraph and radio. Chicago gets the noon signal at 11:00 o'clock in the morning; Denver, at 10:00 o'clock; San Francisco, at 9:00. In some cities, standard time is ignored in the summer, and the clocks are set ahead one hour, in order that more hours of daylight may be utilized (see DAYLIGHT SAVING).

There is one meridian from which nearly all world time calculations are reckoned, and this basal line is the meridian which passes through Greenwich, England. When it is noon there, it is midnight exactly 180° east or west; for every 15° east or west of Greenwich, the time is one hour later or earlier. Holland, however, uses the meridian of Amsterdam, and Greece that of Athens. B.M.W.

Related Subjects. In connection with this discussion of time, the reader should refer to the following topics in these volumes for valuable supplementary information. The articles on the various months and the days of the week may also be consulted.

Calendar	Leap Year
Christian Era	Longitude and Time
Chronology	Minute
Chronometer	Month
Clock	Nones
Day	Olympiad
Daylight Saving	Seasons
Einstein's Theory	Sidereal Time
Epoch	Standard Time
Hegira	Sundial
Hourglass	Watch
Ides	Week
International Date Line	Year

TIME, STANDARD. See STANDARD TIME.

TIME AND SPACE, CONCEPTS OF. See EINSTEIN'S THEORY OF RELATIVITY, subhead.

TIME LOANS. See BANKS AND BANKING (Functions of a Bank).

TIME LOCK. See LOCK (Combination and Time Locks).

TIME MEASURE, TABLE FOR. See DENOMINATE NUMBERS (Other Tables).

TIMOTHY, a coworker with the Apostle Paul, born probably in Lystra, in Asia Minor, of a Greek father and a Jewish mother, Eunice (*II Timothy* 1, 5), who instructed him from childhood in Old Testament Scriptures. Doubtless converted to Christianity on the first missionary journey of Paul, Timothy joined him on his second journey, and continued to the end of the Apostle's life as his trusted associate and friend, succeeding him as overseer, or bishop, of the Church at Ephesus. He is believed to have been martyred, near the end of the first century.

The *First and Second Epistles to Timothy*, with the *Epistle to Titus*, are known as the

Pastoral Epistles. They contain rules for church government, the qualifications of church officers, warnings against false teaching, and counsel to faithful work and the endurance of persecution. There is serious discussion among critics as to whether these epistles are the work of Paul himself, or of some later writer. See PAUL; TITUS.

TIMOTHY, OR **HERD'S GRASS**, a valuable grass widely cultivated for hay. The name *timothy* was adopted in honor of Timothy Hanson, who is said to have introduced the grass into the Carolinas, about 1720. In New York and New England, timothy is often called *herd's grass*; in England, *cat's-tail*. New York is the leading state in the production of timothy hay, and Iowa leads in the output of commercial seed. Canada, too, produces large quantities of hay and seed. This grass is the most important cultivated hay grass of North America. It is a perennial, and grows in tufts to a height of one to three feet, the slender stems bearing cylindrical spikes of minute, tightly packed florets.

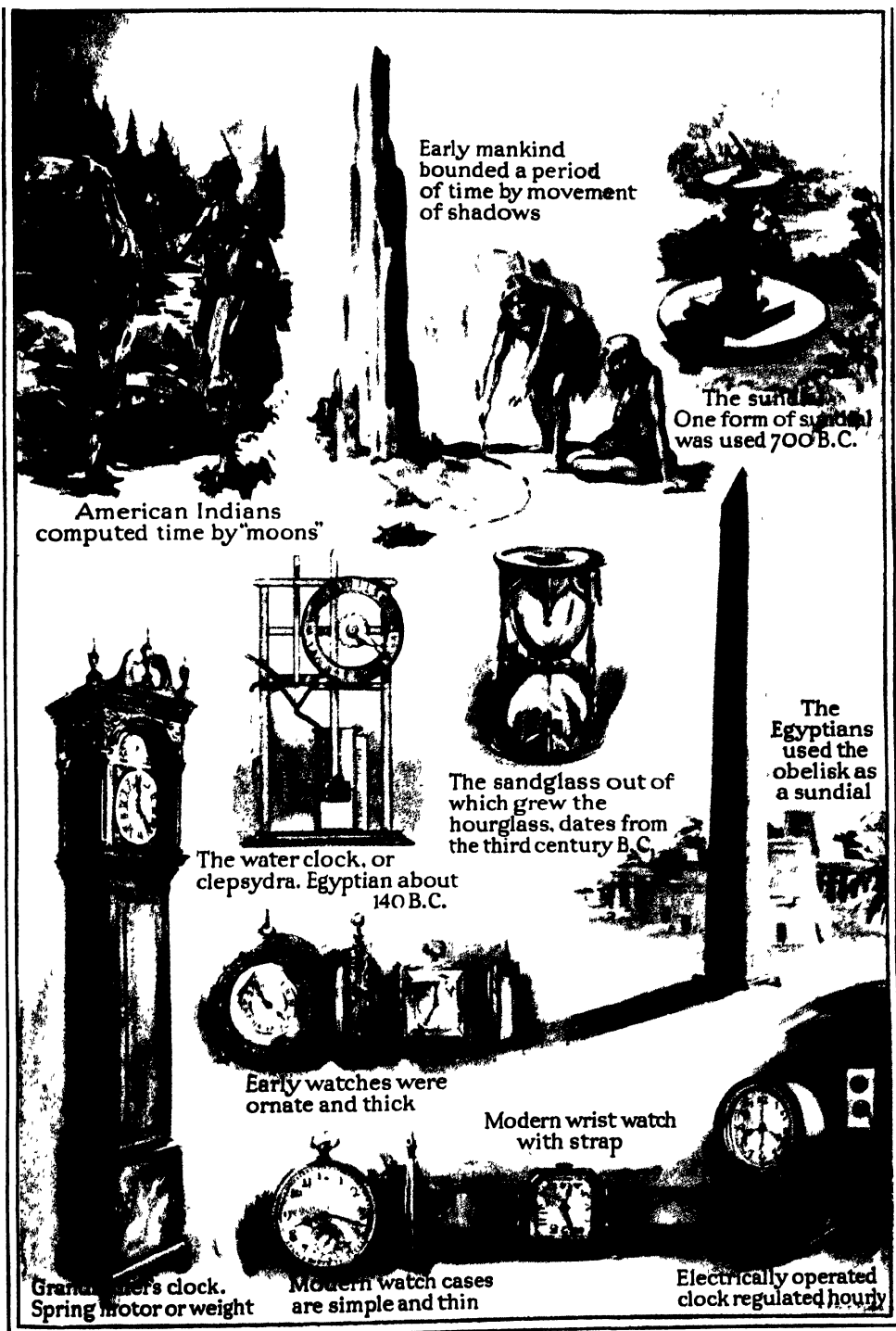
Timothy is a cool-climate plant, and when grown in dry regions, it requires irrigation. It is often planted with clover, though the two do not mature at the same time. Farmers in both the United States and Canada frequently sow timothy seed in a crop rotation with oats and other grains. Since timothy does not endure long under continued grazing, it is not usually considered a satisfactory pasture grass, unless mixed with hardier grasses. It is relished by stock generally, but is especially suitable for horses. See CLOVER; HAY. B.M.D.

Classification. Timothy belongs to the grass family, *Gramineae*. Its botanical name is *Phleum pratense*.

TIMPANOGOS, *tim pah no' gos*, CAVE. See MONUMENTS, NATIONAL.

TIMUR, *te moor'*, more generally known as TAMERLANE (1336-1405), a renowned Oriental conqueror, was born at Kesh, near Samarkand, in Central Asia. From his father, Teragai, head of a tribe, but a man of retiring and studious disposition, he gained a love for reading and a reputation for a knowledge of the Koran. Soon after his twenty-first year, he appeared as a leader of armies, and when Turkestan was subjugated by the Kalmucks under Tughlak, Tamerlane was made governor of Kesh by Tughlak. For some years after the Kalmucks were expelled, he reigned jointly over the country with his brother-in-law, Hosain. He defeated the latter in battle in 1369, and became the sole sovereign, with his throne established at Samarkand. For thirty years, he suppressed foes within his own territory and carried on conquests among the Mongols (which see), as far as the Volga and the Ural rivers, and among the Persians, including principally

MAN'S MEASUREMENT OF TIME



Early mankind bounded a period of time by movement of shadows

The sundial. One form of sundial was used 700 B.C.

American Indians computed time by "moons"

The water clock, or clepsydra. Egyptian about 140 B.C.

The sandglass out of which grew the hourglass, dates from the third century B.C.

The Egyptians used the obelisk as a sundial

Early watches were ornate and thick

Modern wrist watch with strap

Grandfather's clock. Spring motor or weight

Modern watch cases are simple and thin

Electrically operated clock regulated hourly

the possessions of Baghdad and Kurdistan. Wherever he went, there followed death and desolation.

In 1398 he invaded India, and years of bloodshed and devastation followed, as a part of India's gloomy history during this period. Tamerlane's capture of the city of Delhi included an immense amount of spoils and the deliberate murder of over 100,000 men. Naturally, the conqueror's triumphal return to Samarkand was attended with great pomp. Following this came a successful attack on the Turks and the Egyptians, including the capture of Damascus and Aleppo. The restless old warrior finally undertook an invasion of China, but he died of fever and ague in his encampment. His conquests covered the territory from the Persian Gulf to the Volga, and from the Hellespont to the Ganges.

In literature, he has become known through Marlowe's drama *Tamburlaine the Great*. It is generally granted that Timur possessed ability and insight as a statesman and administrator, as well as military genius. He was also a patron of science, letters, and art.

Origin of Name. The name *Tamerlane* appears to be a corruption of *Timur-i-leng*, or Timur the Lame.

TIN, a lustrous white metal, used more than any other material for kitchen utensils and for containers in the canning industry. Though called one of the inferior metals, it adds much to the comfort of daily living, and would be greatly missed if the supply should ever fail. Tin is a chemical element, with the symbol *Sn* (from *stannum*, the Latin name for the metal). It has been in use for at least 10,000 years, and was mined by the ancients in both Spain and Britain. We know that tin was imported from Cornwall into Italy about the time of Caesar's invasion of Britain.

Properties and Uses. Tin is a soft, fairly light metal with a low melting point. Only lead among the metals possesses less ductility, that is, the power of being drawn into a wire when heated; but tin is one of the most malleable metals, and can be rolled into the very thin sheets we know as *tin foil* (which see). As a wrapping to keep out moisture, and as a material for collapsible tubes, tin foil is known in every home.

The tinware found in the kitchen is made of *tin plate*, which is very thin sheet iron or sheet steel, coated or plated with tin. Tin alone is easily bent, and the iron or steel sheets provide strength; the tin, on the other hand, adds color and luster and prevents rust in the other metal. Tin plate, too, is less expensive than pure tin. Since tin is not affected by ordinary atmospheric conditions, nor by weak acids found in food, it is a most serviceable material for coating containers used in canning foods. Tin plate

or terne-plate (an iron sheet coated with lead-tin alloy) is largely used for roofing. Cheap mirrors sometimes are coated with an amalgam of tin and mercury, or with tin foil. Soft solders are alloys of tin and lead; Babbitt metal, an anti-friction alloy used for bearings, is a combination of tin, copper, and antimony; and tin and copper are mixed to make bronze, a metal harder than pure copper and tougher than pure tin. A compound of tin and chlorine is used in weighting silks. This chemical was employed in making smoke screens during the World War. Type metal is an alloy of lead and antimony, with a small addition of copper and tin.

Occurrence. Very little tin is found in the United States. The world production in average years is nearly 200,000 tons. The Federated Malay States have the largest deposits of ore, followed by Bolivia, the Dutch East Indies, China, Nigeria, Cornwall (in Great Britain), Australia, and South Africa. Available sources of supply are not increasing, and many factories produce secondary tin by chemically treating tin scrap.

Preparation for Use. The metal, after leaving the mines, undergoes five important processes before it is a commercial product. The ore contains arsenic and sulphur, and this material is burned out in a furnace or in a roasting machine. If copper sulphide is present, as is often the case, it is converted into copper sulphate by this first process, and is drawn off by leaching. Next, the ore is smelted in a reverberatory furnace; it is heated for about six hours, after which the slag is removed, and then it is heated again for a similar period. The tin, in heated, liquid form, sinks to the bottom of the container, and is drawn off and run into molds to cool.

Since it must be purified to a yet greater extent, the ingots, as the cooled bars are called, are again placed in the reverberatory furnace and heated; the pure tin melts at reasonably low temperature (455° F.), and is run into a container, leaving the final impurities behind. It is then stirred until all gases escape, after which it is cooled. In the process of cooling, the purest tin, being lightest, rises to the top of the mass, the more inferior quality being in the center, while the lower layer is so impure that it must again be put through the purifying process. The pure tin ingots are sent to the rolling mill to be pressed into sheets. T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Alloy	Bronze	Malleability
Babbitt Metal	Ductility	Solders

TINCAL, an impure variety of borax (which see).

TINFOIL, a very thin sheet tin, often alloyed with lead, used for wrapping small articles, such as photographic films, chocolate, or tobacco,

when a moisture-proof covering is required. Formerly, it was made by hammering and polishing white tin, but the modern method is to run the bars of tin through a series of rollers, which press the metal into thin sheets. To keep these brittle metallic strips from breaking apart, after a few rollings they are heated and allowed to cool slowly before the rolling process is continued. A special tinfoil, containing a little copper, is sometimes used for mirror backs. See TIN.

T.B.J.

TINTORETTO, *teen loh ret' loh* (1518-1594), a celebrated master of the Venetian Renaissance, one of the world's greatest painters. His real name was JACOPO ROBUSTI; he was called Tintoretto (meaning *little dyer*) because of the fact that his father was a dyer by trade. The elder Robusti, impressed by his son's attempts to decorate the walls of his shop, took him to Titian, then in the height of his fame, and the latter became the boy's instructor. For some reason, Tintoretto did not remain long in Titian's studio, and the two never were close friends. At the same time, the younger artist appreciated the master's genius, and patterned after him in use of color. His motto was—"The drawing of Michelangelo and the coloring of Titian."

Tintoretto pursued a severe course of study independently, and by the time he had reached the age of twenty-eight, he was painting some of his greatest religious works. Among these was a *Last Judgment*, made for the Church of the *Madonna dell' Orto*. In 1548 he began work on four pictures for the guild house of San Marco, a group which includes the celebrated *Miracle of Saint Mark*. This picture, which the French critic Taine called Italy's greatest painting, is now one of the treasures

of the Venetian Academy. It is especially admired for its dramatic action, a quality which Tintoretto was highly successful in expressing. In 1560 he began a new labor—the decoration of the Ducal Palace in Venice—and about the same time commenced work on the adornment of the walls and ceiling of the guild house of San Rocco. For this edifice he painted one of

his masterpieces, a magnificent *Crucifixion*. The ceiling of the great hall he adorned with the *Plague of Serpents*, *Paschal Feast*, and *Moses Striking the Rock*.

In 1577 the guild commissioned him to paint for the hall and adjoining church three pictures a year, and the two structures to-day constitute a museum of his works, for he faithfully performed this task until his death. The culmination of his activity, however, was the completion of a colossal *Paradise*, covering an entire wall of the Hall of the Grand Council, in the Ducal Palace. This wonderful canvas, the largest oil painting in the world, is 74 feet long and 30 feet high, and contains over 400 life-size figures. Unfortunately, its original splendor has been dimmed



"CHRIST WITH MARY AND MARTHA"

An example of the art of Tintoretto.

by neglect and unskilful attempts to retouch it.

Summary. In the art of Tintoretto we see the combination of a number of tendencies of the Renaissance. He was probably the equal of Titian as a portraitist, and in some respects the latter's equal as a colorist. His imaginative powers were remarkable, and in his ability to express dramatic action, he ranks second only to Michelangelo. Hundreds of his works are preserved in the galleries of Europe, and America also possesses a few examples. Among these are the *Doge in Prayer before the Redeemer* and *Miracle of the Loaves and Fishes*, in the Metropolitan Museum, New York, and a *Senator*, in the Gardner Collection, Boston. In Munich is the painting *Christ with Mary and Martha*.

Another Estimate. The foregoing is the generally accepted estimate of Tintoretto, but there is a modern school of criticism which declares that his contribution to art has been greatly overrated, and that in much of his work his treatment of his subjects is coarse, rather than truly imaginative, his drawing careless, and his color violent. This school, however, credits him with a few paintings of real genius, notably his *Miracle of Saint Mark*, his *Saint Jerome and Saint Andrew*, *Ariadne*, *Pallas Driving Away Mars*, and *Saint George*.

TIPPECANOE, BATTLE OF. See WAR OF 1812 (Story of the War).

"TIPPECANOE AND TYLER TOO." See HARRISON, WILLIAM HENRY.

TIP-TOP HILL, highest point in Ontario. See ONTARIO (Surface and Drainage).

TIRACH MIR, *te' ruch meer*, highest peak in the Hindu Kush range. See HINDU KUSH.

TIRANA, *te rah' nah*, the capital of Albania (which see).

"TIRED" SEA, a name sometimes applied to the Mediterranean Sea (which see).

TIRES, AUTOMOBILE. See AUTOMOBILE; PNEUMATIC TIRES.

TIRO, MARCUS TULLIUS. See SHORTHAND WRITING (Historical).

TIROL, a variant of Tyrol (which see).

TIRPITZ, ALFRED VON (1849-1930) a statesman and chief naval officer under the late German Empire. He was the first man trained as a sailor ever made Secretary of State for Naval Affairs, a position which he held for nineteen years, following his appointment in 1897. His activities in building up the German navy, under direction of Emperor William II, which was in some degree responsible for the World War, are recounted in his autobiography, *My Memories*, published in 1919.

Tirpitz entered the German navy as a cadet in 1865, and reached the rank of post captain in 1880. In 1892 he was made chief of staff of the supreme naval command. Promotions followed at intervals, and in 1911 he reached the rank of grand admiral. In 1908 he became a life member of the Bundesrat, the upper house of the Imperial Parliament. In March, 1916, for political reasons, he resigned all his offices. Following the German revolution in 1918, animosity against Tirpitz resulted in his flight to Switzerland, but he returned to Berlin in 1921, and entered the Reichstag as a German National Deputy. He favored the Dawes Plan, but opposed the Locarno Pact.

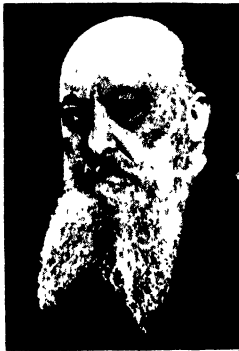


Photo: U & U

VON TIRPITZ

TISIPHONE, *tih sij' o ne*, one of the three Furies (which see), attendants of Proserpina, the goddess of death.

TISSAPHERNES, *tis ah fur' neez*. See ALCIBIADES; XENOPHON.

TISSOT, *te so'*, JAMES JOSEPH JACQUES (1836-1902), a French artist, born in Nantes, whose fame rests chiefly on a series of water-color paintings depicting the life of Christ. The collection, which consists of 350 studies, is in the possession of the Brooklyn Institute Museum. To obtain material for this labor, Tissot spent ten years in the Holy Land, and he painted with painstaking attention to detail and with extraordinary realism. At the time of his death, he was working on a similar series illustrating Old Testament stories. In all, his Biblical pictures number nearly 700. It is a curious fact that, during the first part of Tissot's career, he depicted the worldly and sensual aspects of life in Paris, and it is supposed that his decision to paint religious scenes was the result of a spiritual change within him, as the result of bereavement.

Tissot fought in the Franco-German War, and, becoming interested in the Commune, was compelled to leave France for England, where he spent twelve years, drawing caricatures for *Vanity Fair* and painting portraits. Then, after returning to Paris for a while, he went to Palestine.

Other Works. His earlier pictures are represented by the series *La Femme à Paris* ("The Parisian Woman"). A well-known *Faust and Marguerite* was purchased by the government for the Luxembourg Gallery.

TISSUE, *tish' u*, is defined in physiology as an organization of cells grouped together for the purpose of doing a special work. There are five fundamental types of tissue—epithelial, muscular, connective or supporting, nervous, and vascular. *Epithelial* tissue is that which covers the exterior of the body, lines the cavities connecting with the surface, and forms the glands and the brain—"noblest elements of the body." *Muscular* tissue is made up of a group of cells whose chief property is that of contractility. *Connective* tissue includes groups of cells whose functions are to bind various parts of the body together, and to serve as support for various parts. The chief types of connective tissue are fibrous, elastic, loose fibro-elastic, adipose, cartilage, and bone. *Nervous* tissue is the name given to the particular types of cells that are grouped together to perform the function of conveying nervous impulses. *Vascular* tissue includes lymph and blood, which are fluids containing groups of cells whose function is to carry nourishment and waste products to their proper places in the body. K.A.E.

Related Subjects. For a detailed discussion of these various tissues, consult in these volumes the following articles:

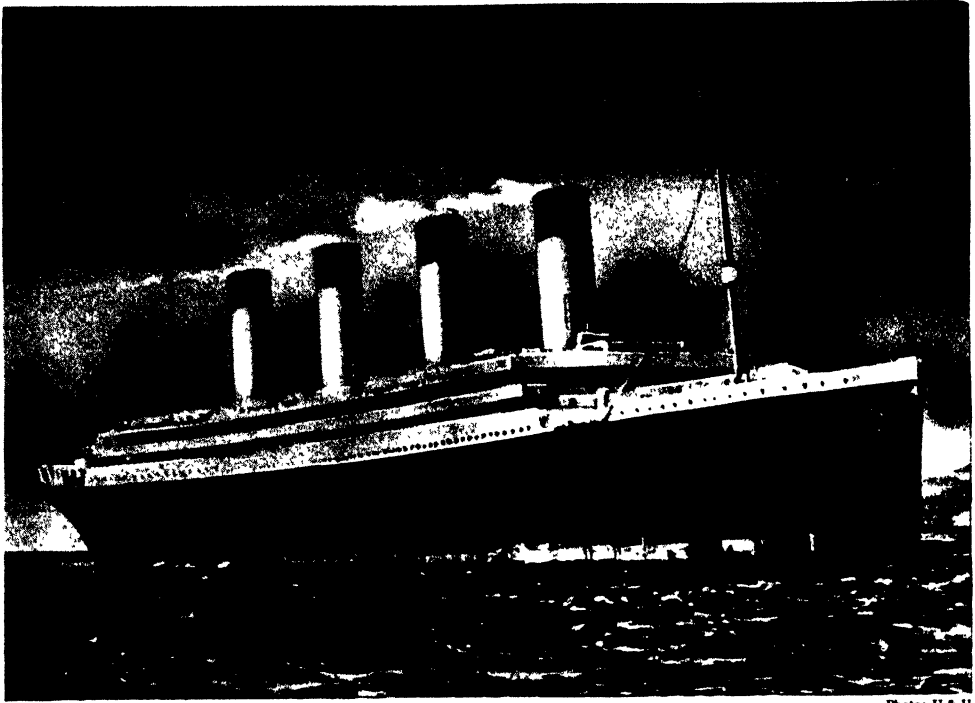


Photo: U & U

THE "TITANIC"

Bone	Membranes
Cartilage	Muscles
Cell	Nervous System
Joints	Skin
Ligament	Tendons

TISSUE JUICE. See CARREL, ALEXIS.

TISZA, te' zah, RIVER. See HUNGARY (Physical Features).

TITAN, ti' tan, satellite of Saturn (which see).

TITANIC, THE, a steamship of the White Star Line, which collided at full speed with an iceberg, on its first trip from Liverpool to New York, and sank within a little over two hours. The disaster occurred at 2:20 A.M. on April 15, 1912, when the steamer was about 1,600 miles northeast of New York. By means of lifeboats and rafts, 711 persons were saved, and were rescued later by the *Carpathia*, which had received the wireless calls broadcast for help; but all the rest of the 2,224 on board, including 832 passengers and 681 of the crew, a total of 1,513, perished. At the time it was launched, the *Titanic* was the largest ship afloat, but others of greater dimensions (see SHIP) have since been built. Its length was 852.5 feet; beam, 92.5 feet; depth, 73 feet 3 inches; gross tonnage, 46,328. Its speed was twenty-one knots (about twenty-four miles per hour). Many notable persons perished, and there were splendid examples of self-sacrifice among the

shipwrecked passengers. See, in this connection, CHARACTER TRAINING (Unselfishness Is Fundamental).

TITANIUM, ti ta' nih um, a rare metallic element which imparts toughness and hardness to steel and luster to silver, and increases the brightness of the flame of an arc lamp when combined with the carbon. It is therefore used in the manufacture of filaments for such lamps. Its salts are used in dyeing. Titanium was discovered in 1789. It is not found native, but when prepared artificially is a greenish-gray powder with a bright, metallic luster. It possesses to a remarkable degree the power of combining with nitrogen at a high temperature. Metals in which it occurs are said to be *titaniiferous*. Though nowhere found abundantly, it is widely distributed, and occurs in many iron ores. It is also one of the elements known to be in the sun. In the United States, it is obtained in commercial quantities from rutile (which see). Its symbol is *Ti* [see CHEMISTRY (The Elements)]. T.B.J.

TITANS, ti' tanz, in Greek mythology, the giant sons and daughters of Uranus (Heaven) and Terra, or Gaea (Earth). Six of them were men, and six were women. The latter were called the Titanides. So strong were the Titans that Uranus greatly feared them, and threw them from Olympus down into a dark cavern in the earth, called Tartarus, where he chained

them fast. Terra grieved over the loss of her children, and urged her husband to set them free; but whenever he heard their angry roars, he renewed his determination to keep them where they were.

Finally Terra grew very angry, and herself descended into Tartarus, where she urged the Titans to revenge themselves upon their father; but all refused to undertake the heavy task except Saturn, the youngest. Terra gave him a magic scythe, released him from his chains, and bade him set forth against his father. Meeting the latter unawares, Saturn defeated him by means of the wonderful scythe, and wounded him severely. So angry was Uranus that he cursed his son and prophesied that some day he, too, would be overthrown by his own child. Saturn released his brothers and sisters, all of whom agreed that he should be ruler over them. He selected Rhea for his wife, and assigned to each of the others some portion of the earth. Later, Jupiter overthrew Saturn, and those Titans who did not submit willingly to his rule were again confined in Tartarus (which see). See, also, RHEA; SATURN.

TITHES, from the Anglo-Saxon *teotha*, meaning *a tenth part*, usually refers to a tax of one-tenth of the profit, or of the produce, derived from the use of land. Moses established the custom of tithes in levying upon the Jews a tax of one-tenth of their possessions or profits, to support the priests. The custom of exacting tithes was almost universal in the ancient world. The Roman Catholic Church, in the sixth century, arranged for payment of tithes for the support of the Church; later, several European countries established the custom, to help pay expenses of royalty.

In England, as early as 786, tithes were exacted for all lands except those belonging to the Church and the Crown, payable in services or profit in kind. Under the present Tithe Acts of England, a tithe rent charge, so called, has been substituted for tithes, and is payable for parish support. The acts do not apply to the City of London, where the rate of tithes has long been fixed by special statutes and local acts. The rate is a percentage of the rent of houses, shops, and the like. In the time of Henry VIII, the rate was fixed at two shillings nine pence in the pound, or about fourteen per cent of the rent.

By an old law in Quebec, the Roman Catholic Church is supported by tithes.

In the United States, no tax of this kind is levied, except by the Mormon Church, in which the law is based upon the old Jewish custom. Many Christian people of all denominations make it a rule to give one-tenth of their incomes to the cause of religion and charity.

TITHONUS, *tih tho' nus*, one of the lovers of Aurora (Eos), goddess of the dawn. See AURORA.

TITIAN, *tish' an* (1477-1576), universally renowned as one of the world's masters of color, was the most eminent artist of the Venetian school of painting during the Renaissance. His real name was TIZIANO VECELLIO; Titian is a variation of Tiziano.

Critics do not hesitate to give him a place among the foremost painters of all time. Of him it has been said, "He is a painter who by



wondrous magic of genius and of art satisfies the eye." It was not his purpose to express through his canvases intellectual ideas, but he aimed to make his works splendid in their pictorial effect, and in this respect he was supremely successful. Titian began his art studies in Venice in his boyhood, and was a pupil of Giovanni Bellini (which see). Among his fellow pupils, who influenced his early work, were Giorgione (which see) and Palma Vecchio. He began to work along independent lines about the year 1513. During this second, or formative, period, which lasted until 1530, he produced several great altarpieces, including the celebrated *Assumption of the Virgin*, which is now in the Venetian Academy (for description, see ASSUMPTION). This is ranked as one of the twelve greatest paintings (see PAINTING). Among other well-known canvases of this period are the *Pesaro Madonna*, in the church of the Frari, Venice; *Holy Family*, in the Louvre; *Bacchus and Ariadne*, National Gallery, London; and a *Flora*, in the Uffizi, Florence.

By 1530 Titian's fame was firmly established, and he had attained a sure grasp of his art. Life for him was thereafter a succession of



The Art of Titian. Above, Mary with Infant, and-at the right, the donor of the picture. [Donors of religious pictures often had their portraits painted in with the Holy Family; thus they required no "press agent."] Below, "Bacchus Finds Ariadne."

triumphs, and princes, dukes, cardinals, kings, Pope Paul III, and even the great Emperor Charles V were among his patrons. In 1532 the emperor commissioned him to paint his portrait, and so pleased was he with the completed canvas that he made the artist court painter and named him Knight of the Golden Spur and Count Palatine. There are several other Titian portraits of Charles V in existence, notably an equestrian portrait of the emperor in full armor (Madrid). The artist also executed a number of portraits of the emperor's son, Philip II of Spain, and he portrayed Pope Paul III, the Duke of Saxony, the Duke of Urbino and his wife, and other persons of high position. The picture of the wife of the Duke of Urbino, Eleanora Gonzaga, now in the Uffizi, is one of the most celebrated of his female portraits. Probably his own daughter, Lavinia, was his favorite subject.

Religious and mythological paintings, too numerous to treat comprehensively, were also produced in this fruitful period of a long career. Representative of these are *Christ at Emmaus*, in the Louvre; *Madonna with Saint John and Catharine*, in the National Gallery, London; *Venus and Cupid*, in the Borghese Gallery, Rome; *Jupiter and Antiope*, in the Louvre; and *Rape of Europa*, in the Gardner Collection, Boston. Something, too, should be said of Titian's treatment of landscape. Though he used scenery merely as a background, or as a setting for his figures, he pictured landscape scenes with great charm, and his work in this field has a definite place in the history of art.

Titian was born in Cadore, in the Alps region, and these mountains and the Venetian lagoons appear again and again in his canvases. He died of the plague in the hundredth year of his life, and was buried in Venice in the church of the Frari.

TITIAN, THE AMERICAN. See ALLSTON, WASHINGTON.

TITICACA, *te te kah' kah*, a picturesque lake in South America, the largest on the continent, forming part of the boundary between Peru and Bolivia. It is situated in the center of a lofty valley surrounded by mountains, and its surface, which is dotted with islands, is about 12,500 feet above sea level. The lake is about 130 miles long, 30 miles wide, and about 3,200 square miles in area. In some parts it is 700 feet deep, but there are many shallow places, and numerous reed marshes occur along its shores. It is fed by numerous streams, and discharges through the Desaguadero River, at its southern extremity, into Lake Aullagas. A fleet of steamers navigates Lake Titicaca, supplementing railway connections between Peru and Bolivia. The region contains many interesting archaeological remains, including some that antedate the Incas. See BOLIVIA (The Land and Its Rivers).

TITLARK. See PIPIT; LARK.

TITLE, a word derived from the Latin *titulus*, meaning an *inscription, label, sign, or token*, has several distinct meanings. As an inscription, it is the descriptive designation which is used as the name of a book or to give some idea of its contents. The term was easily extended to the descriptive heading of written or printed documents, such as deeds, and bills introduced in Congress or Parliament. The various documents, including deeds, which form the evidence of ownership of property, are called *title deeds*, and from this term came the common use of the word title as the "union of all the elements which constitute legal ownership."

Title as Ownership. The elements which give title to property, or constitute ownership, are two—possession and the right of possession. The familiar saying that "possession is nine points of the law" is merely the popular expression of the rule in law that possession is *prima facie* evidence of ownership. But possession is not sufficient if the title is disputed; the right of possession must be proved. In the case of personal property, possession is better evidence of ownership than in the case of real estate, for the title to the latter is usually recorded, either by deed or by some method resembling the Torrens system. An exception to the rule that possession is evidence of ownership is seen in the case of ships, title in which can be ascertained from the register.

Title to personal property may be acquired in several ways. *Original acquisition* is the technical term applied when an inventor, author, or musician holds the ownership in something he has created, or when a man takes for his own use something which belongs to no one else, such as wild animals. Title may also be acquired by gift, contract, or sale, these transfers all being known as *transfers by act of the parties*. A third method is by act of law; for example, in bankruptcy, judgment, intestacy, or marriage.

Ownership of land may be acquired either by *descent* or by *purchase*. These are purely legal terms, and are not used in their popular sense, the second class including "every mode of acquisition of an estate except that by which an heir, on the death of his ancestor, becomes owner by operation of law." Acquisition by descent, therefore, is restricted to a transfer by legal succession or following the death of an owner intestate.

Related Subjects. The reader is referred in these volumes to the following articles:

Copyright	Patent	Torrens System
Deed	Titles of Honor	Trade-Mark

TITLE, ABSTRACT OF. See ABSTRACT (Abstract of Title).

TITLES IN LETTER WRITING. See LETTER WRITING (Use of Titles).

TITLES OF HONOR. Phrases or words applied to the names of individuals or used in addressing them, as a mark of distinction, are known as titles of honor. In its widest sense, the expression refers to all titles, whether official or honorary, military, naval, civil, or ecclesiastical. A narrower definition would exclude those titles which are used as a mark of the bearer's office or profession, and include only those which indicate preëminence, or awards for distinction. Thus, *doctor* or *professor* would not be considered a title if the bearer were a physician or a teacher, but if he had been given an honorary degree from a university, it would be an honorary title. This narrower sense is covered in this article; for titles in the wider sense, see ADDRESS, FORMS OF.

The Federal Constitution forbids any officer or employee of the United States to accept a title from any foreign power, without the consent of Congress; and, under the naturalization laws, any foreigner who holds a hereditary title or title of nobility must renounce it if he becomes a naturalized citizen. In Europe, however, titles are found on every hand. In Great Britain are the five orders of nobility, distinguished by the titles duke, marquis, earl, viscount, and baron; the title of baronet, which is accompanied by the hereditary right to use the prefix Sir, and knighthood, with the same right, but not hereditary, are also purely honorary. The common forms of address, *mister* (master) in English, *monsieur* (literally, "my lord") in French, and *herr*, in German, were once honorary titles, and did not become common to all men until after the French Revolution.

Honorary titles, so far as they are still used in Europe, are survivals of feudalism. They were originally applied to any individual as a mark of honor, but as the fiefs of feudal days became hereditary, the titles, too, descended from generation to generation. Titles were used by the ancient Greeks and the Romans, and especially by the Romans of the Byzantine Empire. "Most high," "most mighty," "most sacred," "all-highest majesty," are, or have been, royal titles or forms of address. The title *caesar*, from which *czar* and *kaiser* are derived, was originally a nickname meaning "long-haired" or "hairy"; from the fact that it was the surname of the great Roman empire-builder, Julius Caesar, it came to have a new meaning; and in later days, all Roman emperors bore the dignified title of *caesar*. The first German emperor is called Charlemagne, or "Karl the Great," but *karl* originally meant merely *man* or *fellow*, and survives to-day in the English *churl* and the German *kerl*. Yet the Slavs, who knew the power of Charlemagne to their sorrow, have made his name the equivalent of king (*kral* or *korol*). These are perhaps extreme examples, but most titles, in fact, quickly became set phrases, without any of

their original significance. Thus, dukes are no longer leaders (Latin *dux*); counts are no longer companions (*comites*) of the emperors; and constables no longer hold the highest office in the Byzantine Empire (*count of the stable*). This later was applied to the commander in chief of the army.

Related Subjects. For details concerning the various titles of honor, consult in these volumes the following:

Address, Forms of	King
Baron	Marquis
Czar	Nobility
Duke	President
Earl	Prince
Emperor	Queen
Kaiser	Rajah
Khan	Rank in Army and Navy
Khedive	Sultan

TITMOUSE, TIT, OR TOMTIT, names of various small, hardy birds, with long, soft plumage, found nearly all over the world. They belong to the same family as the nuthatches. The titmouse eats whatever food is



Photo. Visual Education Service

TUFTED TITMOUSE

to be had, but is especially valuable for destroying millions of insects' eggs and larvae. The most common North American species is the *black-capped chickadee*, a gray and black bird a little over five inches long, which usually keeps to the woods in summer but ranges familiarly around dwellings in search of food in winter, fearlessly answering to an imitation of its call "chick-a-dee-dee-dee," and even taking food from the hand if coaxed. It ranges in Northern United States and in Canada east of the Great Plains, and south to the Carolinas. The chickadee nests in hollow trees or stumps, the eggs being five to ten in number and white

in color, marked sparingly with reddish-brown. This friendly bird has been declared the state bird of Maine, by act of the legislature. In the Southeastern states is found the *tufted titmouse*, somewhat larger than the chickadee, and having a high crest. Its loud call, "peto, peto, peto, peto," is repeated monotonously for hours at a time. The *bush tits* are tiny birds that build a bulky nest, purse-shaped and often a foot in length, which they enter through a circular opening at one side or near the top.



FOOD OF THE BLACK-CAPPED CHICKADEE

Some Old World species of titmice are the *great titmouse*, olive-green in color, with black head and breast, common throughout Europe; the *Japanese titmouse*, a similar bird of Eastern Asia; and *blue titmice*, which include several handsome species of Europe and Africa. D.L.

Scientific Names. Titmice belong to the family *Paridae*. The black-capped chickadee is *Penthestes atricapillus*; the tufted titmouse is *Baeolophus bicolor*. Bush tits belong to the genus *Psaltirparus*.

TITO SCHIPA. See SCHIPA, TITO.

TITUS (A.D. 40-81), a Roman emperor, the eldest son of Vespasian. He was brought up at the court of Nero and served as tribune in Britain and Germany, as well as in Judea. Titus came into prominence in A.D. 70, during the reign of his father, by capturing Jerusalem, after a protracted siege. On his return to Rome, Titus was received with imperial



Photo: Visual Educational Service

TITUS

The coin of his reign shows the ruler's head in profile.

honors, and shortly afterward became a colleague of the emperor. In A.D. 79, on the death of Vespasian, he became sole ruler. He was a man of kindly impulses, and endeared himself to his subjects by his generosity to the sufferers in the eruption of Mount Vesuvius, A.D. 79, and to those who were affected by a destructive



fire and a pestilence which devastated Rome in the following year. The people called him "the Friend and the Delight of Mankind." Titus is renowned in history as a builder. He completed the great Colosseum, which had been begun by his father (see *COLOSSEUM*), built a set of magnificent baths, and restored many ancient buildings then falling into ruin. He died in the third year of his reign.

Arch of Titus, a Roman arch of triumph built by the Emperor Domitian in the year 81, to commemorate the capture of Jerusalem by Titus. It stands on the Sacred Way, facing the Forum, and was rebuilt in 1822. The inner side of the arch is decorated with reliefs depicting the exploits of Titus, and showing spoils taken from the Temple. See next page.

TITUS, a devoted associate of the Apostle Paul, and, so far as is known, the first Christian missionary of purely Greek birth. Some modern critics believe that he was a brother of Luke. He was brought by the Apostle, probably from Antioch, to the council held at Jerusalem to consider how far Gentile converts should be required to conform to Jewish rites, and was excused from circumcision by the decision of that body. He was regarded by Paul with great affection, and accompanied the latter on many of his journeys, succeeding him as overseer, or bishop, of the churches of Crete, after Paul's death.

The *Epistle to Titus* is of the same authorship and general contents as the *Epistle to Timothy*. See PAUL; TIMOTHY.

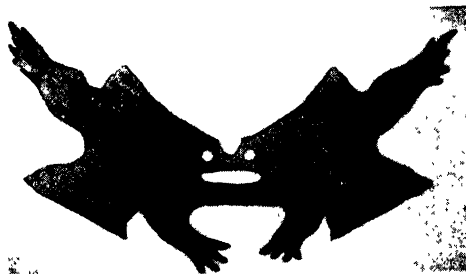
TIW, OR **TYR**, Norse god of war. See TUESDAY.

TLEMSEN, *ilem sen'*, a city in Algeria (which see).

TLINGITS, OR **THLINGITS**. See ALASKA (The People).

T.N.T. See EXPLOSIVES.

TOAD, *tohd*, a cold-blooded animal resembling the frog. The toad makes its home in shady places in fields and gardens, and as one

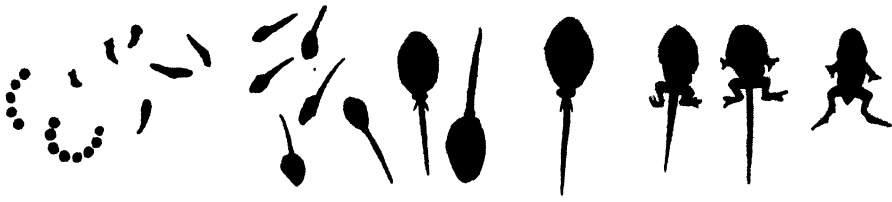


SKIN OF THE TOAD
It is shed in one piece.

of the greediest eaters of grubs and insects, it is a valuable ally of the farmer and the gardener. Toads and frogs are tailless amphibians (which see). The body of the toad is thicker



The Arch of Titus. Erected in honor of his sack of Jerusalem, in A. D. 70. The processional group beneath the arch represents bearers carrying the seven-branched candlestick taken from the Temple. Between this arch and the Colosseum the ancient pavement of the Sacred Way still remains. See **ROME (Ancient)**.



FROM TADPOLE TO YOUNG TOAD IN SIXTY DAYS

and more bulky than that of the frog, and its movements are slower and more clumsy. Frogs have no warts, and live mostly in water; toads have a warty skin, and spend most of their lives hopping about on land. The toad's rough skin is the color of the ground, and this similarity helps to protect it against its foes. Unlike the frog, it has no teeth and cannot bite. Its skin, however, contains glands that secrete a milky fluid which is poisonous to



THE TOAD'S TONGUE

Showing the movement of the tongue in catching an insect. This organ is fastened in front instead of at the back, and can be extended fully two inches in an exceedingly rapid movement. Its surface is sticky.

some animals that seek the toad as prey. This secretion does not cause warts on the hands of persons touching toads, but it is irritating, and in some cases may be poisonous to the human skin. With patience and tactful feeding, a toad may be tamed, but it must never be picked up or handled, for it will then become frightened and hop away.

Although "ugly and venomous," the toad "wears yet a precious jewel in his head." In these words Shakespeare described the animal's glittering, golden eyes, which, when open, protrude prominently. They are provided with lids which rise from below, like those of birds. When the toad is asleep, the eyes are drawn in and lie even with the surface of the head. The toad has no ribs to aid in inflating the lungs, and is obliged to swallow the air instead. Another curious thing about this animal is the way in which it "drinks," not through its mouth, but by absorbing the water through its skin.

Toads sleep through the winter in burrows in the ground, emerging in the early spring. They migrate to the nearest pond, where they lay their eggs. These are about the size of a pinhead, and are bound together in long strands by a transparent, jelly-like substance. The small, flat tadpole is hatched in from two to four weeks, and attains adult size in about two months. The outer skin of a toad is molted several times a year, and on each occasion it is swallowed.

It is not likely that toads will ever become too numerous, for they have many natural enemies. The tadpoles are the prey of newts, water beetles, and fish, and the toads are eaten by snakes, hawks, crows, and owls.

The toad genus (*Bufo*) is represented in every part of the world except Australasia and Madagascar. There are about 100 species in all.

Economic Value. At night, the toad leaves its hiding place under leaves or stones

and ventures forth in search of food. It will eat only live grubs and insects, which it snatches up with its sticky tongue and horny, toothless jaws, and swallows whole. To employ it in a



Photo: Saint Clair

AN EXAMPLE OF PROTECTIVE COLORATION

The toad resembles the stones in form, color, and even in surface appearance. See PROTECTIVE COLORATION.

professional capacity as an exterminator of insects is a new solution for the bug problem. It is estimated that a toad is worth five dollars a year to the farmer for the destruction of cutworms alone. It will also devour 100 rose



Toadstools Might Be Called Toad Umbrellas. This is an unusual nature photograph. A toad is endeavoring to enjoy the shade under his special parasols.



Photo: O R O C

A TOBACCO PLANTATION IN SUMATRA

The tobacco of Sumatra is largely used for wrappers on cigars. Ninety per cent of the island's production is exported to the United States.

beetles or over fifty army worms at a meal, and at the same time feed on countless others of the worst bug pests. Even in its infancy, the toad is a serviceable little creature. The tadpole eats the slimes of pools, and is the best scavenger of stagnant water. M.J.H.

Scientific Names. Toads belong to the family *Bufo* *idae*. The best-known species of North America are *Bufo americanus* and *B. lentiginosus*.

Related Subjects. For eighteen pictures showing the life history of the toad, see *NATURE STUDY*, page 4831. The reader may also refer to the following articles in these volumes:

Amphibians Frog Tadpole Tree Frog

TOADFLAX, OR BUTTER AND EGGS, a weed of the figwort family, with bright-yellow flowers and pale gray-green leaves, found along roadsides and in waste places throughout Central North America, as far west as the Rocky Mountains. The flowers, which grow in clusters along the upper part of the stem, are tube-shaped, with the edge cut into an upper and a lower lip, the former having two lobes and the latter three. A thick, orange-colored ridge on the middle lobe serves to cover the mouth of the tube, and this is forced open by the weight of the bee in search of nectar. Toadflax was introduced into America from Europe, and is an escape from gardens. It belongs to the same family as the snapdragon (which see). B.M.D.

Scientific Names. The botanical name of the figwort family is *Scrophulariaceae*. The toadflax is *Linaria vulgaris*.

TOADSTOOL. See MUSHROOMS.

TOBACCO, *toh bak' o*, a plant of the nightshade family (*Solanaceae*), whose leaves have enormous commercial value. Tobacco is not a food, nor can it be said to fulfill any essential human need, but because its manufactured products are a source of pleasure to great numbers of the human race, it has an established place among plants cultivated for industrial purposes. Its effects are discussed under a subhead, below (see *Effects of the Use of Tobacco*, page 7196).

The Plant and Its Cultivation. There are several species of the tobacco plant, but that designated as *Nicotiana tabacum* (native to America) is commercially the most important. This plant grows from two to eight feet high, and bears long, pointed leaves and terminal clusters of rose-colored or pink-and-white, funnel-shaped flowers. The leaves grow directly from the stalk, and vary from twelve to forty-two inches in length. Different soils and climate have more influence upon the character of tobacco and the quality of the leaf than upon any other cultivated plant. The soils affect the color and texture of the leaf and the amount of nicotine it contains. The highly fertile limestone soil of the blue-grass regions of Kentucky produces the light-colored, mild variety known as *White Burley*; the red clay soils are best for the dark, heavy types; the light, sandy soil of the "Golden Tobacco Belt" in Virginia produces the yellow variety; and the strong, dark *Perique*, a variety much used for smoking tobacco, is grown in the heavy, black soil of Louisiana.

Tobacco is grown from seed sprouted in carefully prepared beds; in cold climates, the plants are started in hotbeds. The seed is very small, and a handful looks very much like a quantity of finely ground black pepper. When the young plants are six to eight inches tall, usually five or six weeks after the sowing, they are ready to be transplanted. The ground, meantime, has been thoroughly cultivated, and enriched with fertilizer. Long-leaf varieties



THE TOBACCO WORM

demand proportionately more space than do smaller varieties, and the distances between hills vary from twelve inches to four feet. If transplanting is done by machinery, from three to six acres a day can be worked. With hand labor, an industrious workman can set from one to two acres in the same time.

Frequent cultivating and the elimination of weeds and of insects and their larvae are necessary. Topping of the plants to prevent flowering, and to concentrate the strength in a few leaves, is practiced in the production of tobacco raised for leaves and not for seeds. Topping results in the formation of false leaves, or suckers, and these must be pulled off as fast as they appear. In several states, the United States Department of Agriculture has made experiments in the cultivation of tobacco under canvas covers. This method causes the plants to mature earlier and to bear finer and more delicately flavored leaves.

Harvesting and Curing. Tobacco leaves are ready for harvesting when the surface becomes a mottled yellow and green. The methods of cutting and curing vary for different kinds of tobacco. In some cases, the entire plant is cut down when the middle leaves are ripe, and in others the leaves are removed separately as each one matures. In harvesting White Burley, which is used extensively for making plug and fine-cut chewing tobacco, the entire stalk is cut, and then split more than half the length. The stalks are then wilted and placed astride a stick, at the rate of about seven plants to a stick. After being left for a time in the open air, the plants are taken to ventilated sheds,

where the leaves are cured by exposure to air. Yellow-tobacco leaves are stripped from the plants as they ripen, and are cured in houses equipped with flues that convey artificial heat. Heavy tobaccos raised in America for export to Europe are cured by the heat of open log fires, as the smoke imparts a creosotic flavor that is very popular with Europeans.

Perique, which is one of the choicest grades of smoking tobacco, and is prized because of its rich flavor, is cured by subjection of the leaves to great pressure. The Maryland type, a variety exported in large quantities to Holland, Belgium, and France, is air-cured, like White Burley, in ventilated sheds. A high-grade chewing tobacco with a sweet, delicate flavor, which is grown to a limited extent in Spottsylvania County, Va., is cured in the sun. This method is too expensive to be adopted generally. After tobacco is cured, it is softened in moist air, packed in boxes, and taken to the warehouse, where it must undergo a "sweating," or fermenting, process before it is ready for the market. This is for the purpose of improving aroma and texture.

Tobacco Enemies. The tobacco plant is subject to root rot, mosaic disease, or mottled top, wild fire, and a few other diseases, but the only serious insect pests that attack it are the larvae of two species of sphinx moth, which feed on the leaves. They are large, green caterpillars having diagonal white stripes along the sides, and a sharp horn at the back of the body. These worms also feed on the leaves of the tomato plant, another member of the nightshade family. Weeds of the nightshade group planted near tobacco fields will serve as a decoy for the pests, and heavy applications of Paris green will kill them. See INSECTICIDES AND FUNGICIDES.

Production. The United States is the leading country in the production, consumption, and export of tobacco. North Carolina, Kentucky, Virginia, and Tennessee produce about three-fourths of the annual yield; the remainder of the crop comes chiefly from South Carolina, Pennsylvania, Ohio, Georgia, Wisconsin, Connecticut, and Maryland. Flue-cured tobacco, used extensively in the manufacture of cigarettes, is produced chiefly in Virginia and the Carolinas. Large quantities are exported to Great Britain. Over seventy-five per cent of the Burley type is produced in Kentucky, and the remainder chiefly in Tennessee, Ohio, and Indiana. Nearly all of this crop is consumed in the United States. Cigar types of tobacco are produced chiefly in Pennsylvania, Connecticut, Wisconsin, and Ohio, and little of the yield is exported. The annual tobacco crop of the United States as a whole ranges between a billion and a billion and a half pounds (for comparison with other countries, see chart, page 7196).



Photos: Keystone

Tobacco-Growing in Connecticut. In the upper picture the young man is "topping" the plants—plucking off the flowering tops, so that ripening will be hastened. Below, at left, view of a leaf of the broad-leaf variety; at right, plants going to seed, to provide for next year's crop.

Holland first cultivated tobacco in Europe, but the industry soon spread to other countries. British India, Russia, Hungary, the Dutch East Indies, Japan, the Philippines, Porto Rico, Santo Domingo, Cuba, Brazil, Turkey, Greece, and Italy are all important tobacco countries. Since the World War, Can-



CENTERS OF PRODUCTION

The chief tobacco fields are indicated by the groups of dots on the map.

ada has developed a rapidly growing and profitable tobacco industry. The plant has long been cultivated by the "habitants" of the province of Quebec.

Manufacture. The manufacture of tobacco products is an industry of enormous proportions. Only the income tax is a greater source of revenue to the American government than the tax on tobacco in its various forms. The chief products are cigars, cigarettes, and smoking and chewing tobacco. The first steps in the manufacturing process are the cleaning and stripping of the leaves. By *stripping* is meant the removing of the midribs and stems. Tobacco for chewing may be either "fine-cut" or "plug." In the latter form, the tobacco is pressed into cakes and flavored with vanilla, licorice, chocolate, sugar, etc. Pipe tobacco is finely cut or sliced, and marketed in small bags or tins, or is put up in thin cakes or rolls, to be cut up by the smokers. North Carolina leads in the manufacture of cigars, and Pennsylvania in the making of cigarettes. The popularity of cigarettes has so increased since the World War that the annual output is now about 80,000,000,000.

Cigars are made from carefully selected leaves, for the inner material, known as the *fillers*, must be of uniform quality. A cigar consists of core (fillers), an inner cover, or binder, and an outside cover, or wrapper. The core must be so arranged that the cigar will burn evenly and the smoke will be freely drawn through it. The two covers are made of tobacco leaf, and the outside piece is shaped

so that it can be wound about the cigar in a spiral. After being wrapped, the cigar is dried in the sun or in mild artificial heat.

The finest cigars made are manufactured in Cuba of a native tobacco called *Vuelta Abajo leaf*. The word *Havana* is the trade name for all cigars made from Cuban tobacco, but genuine *Havanas* are produced only in the island or in Florida, where there are a number of factories having Cuban workmen. In the manufacture of high-grade cigars, much of the work is done by hand, but cheaper brands are generally made by machinery. See, also, CIGARETTE.

Effects of the Use of Tobacco. Ever since tobacco was first used in Europe, its influence upon the health and morals has been the subject of much discussion. Most of the injurious effects are due to the presence of nicotine, which is a poisonous alkaloid. Like alcohol, opium, tea, and coffee, tobacco possesses nar-

BY COUNTRIES

United States 1304 British India 1103

Greater Russia 356 and Madura 155

Brazil 148 Japan 144

Greece 136 Turkey 118 Philippines 104

BY STATES

North Carolina 443 Kentucky 302

Virginia 126 Tennessee 72 South Carolina 89

Figures Represent Millions of Pounds

TOBACCO PRODUCTION

Figures are from Federal and state sources, and represent averages for three years.

cotic properties, and it is generally agreed that its use in excess is harmful, and that its habitual use by the young decreases bodily and mental vigor and development. After mental or physical strain, its narcotic properties have a soothing and restful effect upon the nerves, and it is to this quality that it owes its wide popularity. No reasonable evidence has been produced to show that the use of tobacco deadens the moral sensibilities, as is true of opium, morphine, and alcoholic drinks, and many psychologists and medical men, after careful investigation, have come to the conclusion that there is no serious objection to its moderate use by adults. The smoke of tobacco usually contains nicotine, and is harmful when inhaled.



Photos: Keystone

Shade-Grown Tobacco. Above, tents over a tobacco field near Hartford, Conn. Below, trucking the tent-grown product from the field to the curing barn.

History. Although it is believed that tobacco was used in China in ancient times, the knowledge of the plant and its uses spread to the rest of the world through America. At the time Columbus discovered the New World, the Indians were smoking and chewing tobacco, and using it as snuff. Their pipe of peace was used in tribal ceremonies that had been practiced for centuries. The plant was introduced into Spain from Santo Domingo in 1559, and in the same year, seeds were sent to France by Jean Nicot, the French ambassador to Portugal, who gave his name to the essential principle of the plant, and to the genus, *Nicotiana*. Sir Francis Drake took tobacco to England in 1585, but it was through the illustrious example of Sir Walter Raleigh, who "took a pipe of tobacco a little before he went to the scaffold," that smoking spread among the Elizabethan courtiers. Although smoking was strongly opposed by the Church and State, and its devotees were threatened with severe penalties, such as the lash, excommunication, and even capital punishment, the popularity of tobacco spread with amazing rapidity in the seventeenth century, throughout the nations.

G.M.S.

Related Subjects. The reader is referred in these volumes to the following articles:

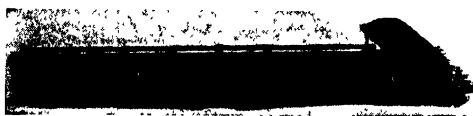
Anti-Cigarette League
Cigarette
Internal Revenue

Narcotic
Nicotine
Snuff

TOBACCO ROOT. See BITTERROOT.

TOBACCO WOOD. See WITCH-HAZEL.

TOBOGGANING, *loh bog' an ing*, an exhilarating outdoor sport, which consists of coasting on snow or ice by means of toboggans, or sleds without runners. A typical toboggan is shown in the accompanying picture. It is made of strips of hickory, ash, or maple, turned up in front and fastened together by crosspieces



A TOBOGGAN

The surface that touches the snow or ice is highly polished, and there is a light handrail on each side. The sled is usually about a foot-and-one-half wide and from six to eight feet long. A toboggan load consists usually of four people, the one at the rear acting as steersman, by means of an extended moccasined foot. In mountainous countries, the snow-covered hills are used for slides, but in level localities, chutes are constructed on scaffolding, with a platform at the top for the take-off. A tremendous rate of speed is possible, 900 yards in thirty seconds having been recorded.

Toboggans were originally built by Indian hunters to carry their game across the snow.

They were first built of bark, turned up in front to breast the snow. The Eskimos made sledges of strips of whalebone until recently; now they are able usually to obtain strips of iron, or, more commonly, lengths of wood, which they obtain from explorers. See illustration, article QUEBEC (city).

TOBOLSK, *loh bolsk'*. See SIBERIA (People and Cities).

TODD, MARY, the wife of Abraham Lincoln (which see).

TODOS SANTOS, a peak in Bolivia. See BOLIVIA (The Land and Its Rivers).

TOGA, the national garment of the Roman male citizen, numerous references to which occur in classic Latin writings. Originally, it was worn over the tunic by both men and women, but the latter eventually replaced it by the stola (which see). The toga was a sheet of closely woven woolen cloth, the exact shape of which is disputed by authorities. Some say that it had the form of a segment of a circle, the chord of the arc being about three times the height of the wearer, and the height of the segment not quite half the length of the chord. Others say that it was elliptical in shape and was folded lengthwise before being put on. One end was thrown over the left shoulder and permitted to hang down in front, while the rest of the garment was drawn around the body and variously arranged, the style of arrangement differing at various periods of Roman history.



ROMAN TOGA

The plain white garment of the ordinary citizen was known as the *toga pura*. The *toga praetexta*, having a border of purple or crimson, was worn by curule magistrates and some priests, and also by boys until they reached the age of sixteen. The latter assumed the plain white toga (*toga virilis*) at sixteen, an important event in the life of every boy. At the celebration of a triumph, generals donned a purple or crimson toga embroidered with gold (*toga picta*), which was worn over a gold-embroidered tunic (*tunica palmata*); this was also the garb of magistrates presiding at games,

and was adopted by Julius Caesar as his regulation dress. A toga smaller in size than the *toga pura*, having scarlet stripes, worn by the consuls when they opened the temple of Janus, and by certain other officers, was known as the *trabea*. The *toga candida* was the clean and artificially whitened garment in which the candidate for office appeared, while persons in mourning wore a soiled and carelessly arranged toga (*toga sordida*).

The toga was so intimately associated with the activities of the ancient Roman that it became the distinctive badge of his citizenship, and its importance is to-day reflected in current speech. Thus, the men who assume the duties of lawmaking, especially Senators, are said, in figurative language, to have "donned the toga."

Derivation. *Toga* is derived from the Latin *tego*, meaning *I cover*.

TOGO, *toh' go*, HEIHACHIRO, Count (1847-), a Japanese admiral and naval hero of the Russo-Japanese War, was born in Kago-shima, of a family belonging to the military nobility. He entered the naval service at the age of sixteen, later received instruction on the British war vessel *Worcester* and at the Naval College at Greenwich, and in 1894, while commanding the *Naniwa*, fired the first shot in the Chinese-Japanese War. Promoted to rank of vice admiral in 1900, he was made commander of the naval dockyards at Maizuru, and in that capacity did much to build up the navy which, under his command, signally defeated the Russians in 1904-1905. For his part in that struggle, see the article RUSSO-JAPANESE WAR. In 1912 Count Togo was made admiral of the Japanese fleet, which now ranks third among the world's navies.

TOGO AND TOGOLAND, *toh' go land*, mandated territories of West Africa, under French and British influence, respectively; formerly, a German colony, annexed by Germany in 1884, and captured by troops of France and Britain in 1914. The entire territory was long known as Togoland; Great Britain retained the name when the two conquering nations divided it and received governing mandates from the League of Nations, in 1919, while France renamed its section Togo.

The entire area is a narrow strip extending north from the Gulf of Guinea, with Dahomey on the east and the Gold Coast Colony on the west; the coast line is only thirty-two miles in length, but farther north the width of both sections is over seventy-five miles.

Togo. The French section occupies two-thirds of the entire area, about 22,000 square miles in extent, and has 750,000 inhabitants, of whom not more than 350 are white. More than forty languages are spoken by the natives, the larger portion of whom are offshoots from the Bantus (see BANTU). The seat of

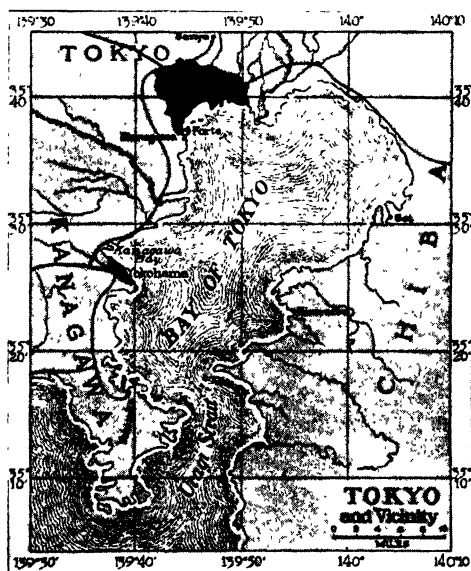
administration is at Lome, a seaport on the Gulf of Guinea.

Togoland. The British section is west of Togo, and borders the Gold Coast Colony, to which it is attached for administrative purposes. No part of its area of 13,040 square miles touches the coast. The inhabitants number about 190,000, and of this number less than fifty are white.

The climate of Togo and Togoland is hot and unhealthful. Old Togoland was once in the center of the slave trade, and to it was due any early importance of Lome, the seat of administration of Togo. The principal exports are palm oil, rubber, ivory, and copra. Elephants and lions are found in the interior, but the elephants have been so much hunted for ivory that they are becoming scarce. Yams, corn, bananas, ginger, tobacco, and cocoa are extensively cultivated. The natives are expert wood carvers, and have considerable knowledge of dyeing and weaving.

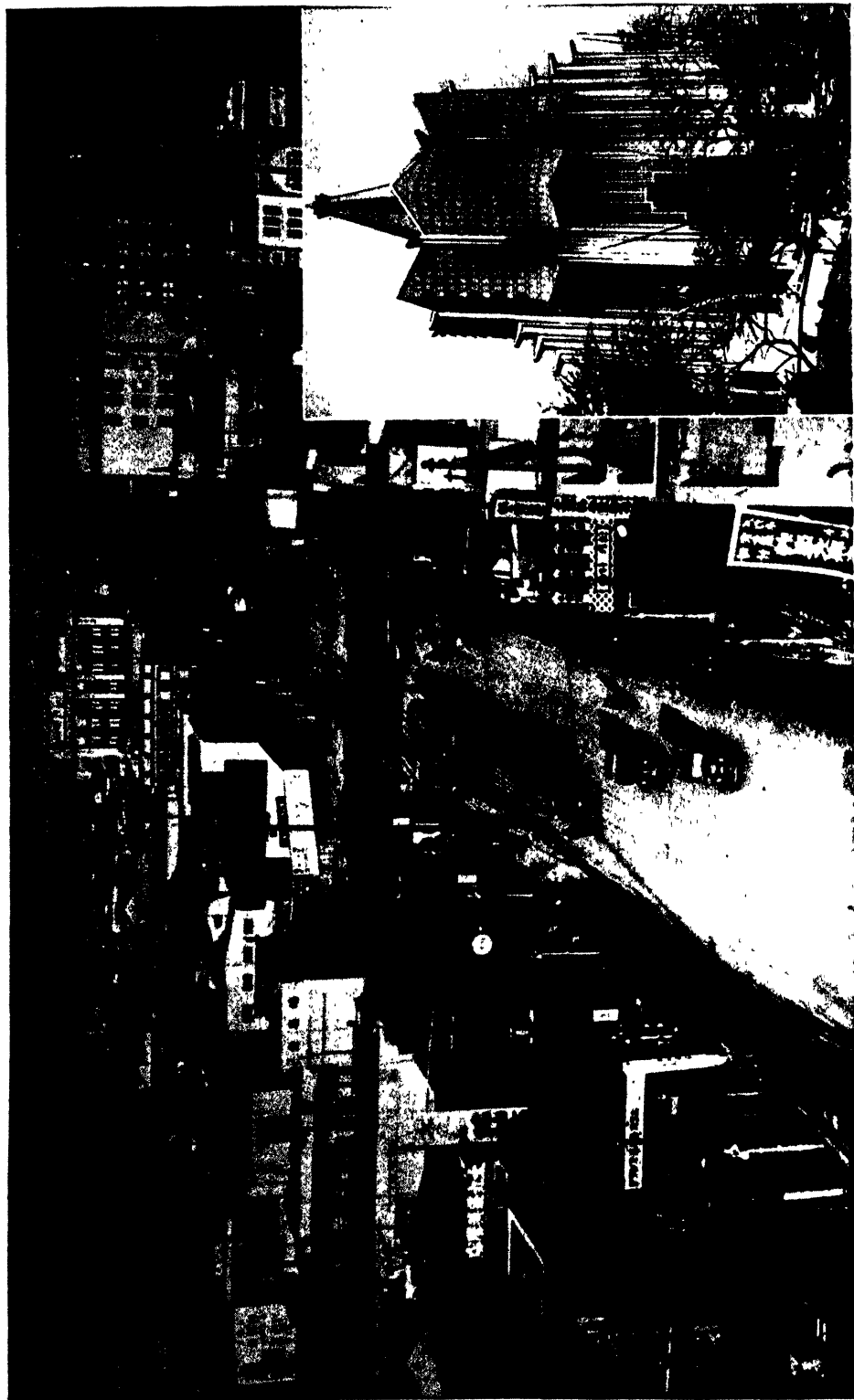
TOKEN MONEY. See MONEY (Classes).

TOKYO, OR **TOKIO**, *toh' ke o*, the capital and second largest city of the Japanese Empire, is situated on the Bay of Tokyo, on the south-eastern shore of the island of Honshu. Sixty



miles west of the city, and visible from almost any point of the island, as well as far out at sea, rises the lofty white cone of Mount Fujiyama.

Tokyo in 1922 annexed surrounding suburbs until its area reached 161 square miles. Its population was 1,995,567 in 1925, making it the tenth city in size in the world. For the last decade or longer, Tokyo has been assimilating European and American ideas in sanitation, building, and transportation, until it has become the most progressive and cos-



Photos: U & U

Modern Tokyo. Since the earthquake and fire of September 1, 1923, the capital city of Japan has adopted building standards of America and Europe. The inset

mopolitan city of Japan, characterized by ancient picturesqueness and the modern customs, costumes, and conveniences of Western civilization. The city's advance was halted, however, on September 1, 1923, by the most disastrous earthquake and fire the modern world has known, when a large part of the metropolis was destroyed; after the earthquake ceased, the resulting fire swept over twenty-five square miles of the city's area. Though temporary restoration began immediately, and communication and public services were completely restored within a few months, there cannot yet be an adequate description of the new city, so rapidly is it being rebuilt and modernized.

The city occupies both banks of the Sumida River, sometimes called "the Thames of Tokyo," the flat areas constituting lowland Tokyo, while in the western outskirts rise hills from fifty to over a hundred feet in height. A network of canals occupies the lowland section, and these and the river are spanned by numerous bridges. The most conspicuous feature of the city is the Imperial Palace, on the site of the old castle of the shogun, which was burned in 1872. The palace is a beautiful structure, partly in the Japanese and partly in the European style of architecture; and the surrounding grounds, in which stand several modern government buildings, constitute one of the loveliest parks in Tokyo. The palace was one of the buildings that escaped destruction by the great earthquake and fire.

The section east of the royal palace is occupied by warehouses, banks, shops, newspaper offices, and other commercial buildings. In this section, crossed by jumbled streets and alleys, one saw, before the 1923 disaster, small wooden shops and houses, mud buildings, and modern structures of brick and stone; rebuilding plans included the widening and straightening of most of the streets. The northern part of the city contains the arsenal; the Imperial University; Ueno, an extensive park containing the Zoölogical Gardens, the Imperial Library, and the Imperial Museum; and a famous temple to the goddess of mercy, in a spacious park that is a favorite resort for the people on holidays. In 1925 the Rockefeller family gave \$2,000,000 to the University Library. An art gallery, planned before the earthquake, was completed in 1926.

The section east of the river is especially interesting to tourists, because here may be seen the flower displays of cherry blossoms, wisteria, and iris for which Tokyo is famous; and the great wrestling matches, held in the temple of E-ko-in. The so-called Foreign Concession is on the west bank of the Sumida, but for a long time there have been no restrictions as to the section in which foreigners may reside. The streets leading from the foreign quarter

contain many shops, where wonderful ivory carvings and other specimens of Japanese handiwork are displayed.

Tokyo is governed by a mayor, a municipal council, and a municipal assembly. The city is not so important a commercial or industrial center as some other towns in Japan, though many factories have been established. The river is too shallow to permit navigation by large vessels, and Yokohama, eighteen miles south, is the port of Tokyo. The capital is connected with all parts of the island by railways.

Tokyo is the outgrowth of a small village called Yedo, and the city which developed from this hamlet was known as Yedo until 1868, when the present name was adopted.

TOLEDO, *toh le' doh*, OHIO, a port of entry and the county seat of Lucas County, situated in the northwestern part of the state, on Maumee Bay, at the mouth of the Maumee River. It is nine miles from Lake Erie, of which Maumee Bay is an inlet, and its northern limits extend almost to the Michigan state line. Cleveland is 113 miles east, and Columbus 134 miles south. The city lies on both sides of the Maumee, which curves at this point, before emptying into the bay. Most of the city is on the west side, which is connected with the east side by seven bridges. The harbor of Toledo extends for thirty-five miles along the shores, and can accommodate the largest lake vessels, having a minimum depth of twenty-one feet. The population of the city in 1928 was 313,200 (Federal estimate), including a large foreign element, chiefly German, Irish, Polish, and Scandinavian.

Features of Interest. The city is well supplied with large hotels and business buildings. It has shaded residential streets and beautiful schools and public buildings. There are 742 miles of streets, of which 360 miles are paved; twenty-one miles of boulevards; and a park system covering 2,004 acres. The Zoölogical Garden, the Soldiers' Memorial, the Newsboys' Building, the Armory, and a statue of President McKinley—all well repay inspection.

Transportation. Railway-transportation facilities are provided by the Ann Arbor, the Baltimore & Ohio, the Cleveland, Cincinnati, Chicago & Saint Louis, the Hocking Valley, the New York Central, the Nickel Plate, the Pennsylvania Lines, the Pere Marquette, the Wabash, and the Wheeling & Lake Erie railroads. Steamers ply between Toledo and the other lake ports, and a fine system of interurban and motorbus lines supplements the railroad service. The city is on several Federal highways, and has a municipal airport of 225 acres. Its lake steamship traffic gives Toledo high rank among the lake ports.

Industries. The city is an important shipping point for iron and soft coal from West

Virginia, Ohio, and Pennsylvania. There are five large oil refineries, and about 750 manufacturing plants, making canvas goods, lime, children's vehicles, fountain pens, springless scales, and other commodities. The city ranks among the largest producers of automobiles and automobile parts. Glass-making, ship-building, and the grinding of coffee and spices are also important industries. There are numerous wholesale and jobbing houses in Toledo, and it is a foremost market for clover seed, hay and grain, and winter vegetables.

Institutions. Among the educational institutions are the University of the City of Toledo, founded in 1872 as a private school and organized as a municipal university in 1884; Saint John's University, Roman Catholic, founded in 1898; Toledo Medical College; the Smead School for girls; several other private secondary schools; sixty public and thirty-five parochial schools; a public library with fourteen branches; and an Art Museum with a fine collection of Egyptian antiquities and many notable paintings.

The benevolent institutions include a state hospital for the insane, which is conducted on the cottage plan; Saint Vincent's Hospital, Saint Vincent's Orphanage, the county hospital, the county children's home, and the Lutheran Orphan Asylum.

History. The city of Toledo lies within the limits of a large tract of land acquired in 1795 by the United States from several Indian tribes. About the year 1800, a stockade was built, and, almost prophetically, was called Fort Industry. Two separate land companies, buying from the government most of the land now the site of the city, laid out two villages, Port Lawrence in 1817, and Vistula in 1832. These villages were united as a town in 1833, under the name of Toledo, and a city charter was obtained in 1837.

What is known as the Toledo War was a contest in 1835 between the state of Ohio and the state of Michigan for the possession of a strip of rich agricultural land including the site of Toledo, which was recognized even then as being commercially important. In June, 1836, Congress decided the dispute in favor of Ohio, but Michigan, when it was admitted to the Union, in 1837, received the Upper Peninsula as compensation.

The opening of the Wabash & Erie Canal in 1843, and of the Miami & Erie Canal two years later, and the construction of steam railroads to this point in 1837, were important factors in the growth of the city.

The civic administration of Toledo became famous at the beginning of the century, when Samuel Milton ("Golden Rule") Jones, as mayor (1897-1905), introduced actual business methods into the management of the city, which operates under the mayor-and-council

form of home-rule government. A comprehensive plan has been adopted for future construction in the city, under the auspices of an official city-plan commission.

TOLEDO WAR. See MICHIGAN (History); TOLEDO (History).

TOLERATION ACT. See NONCONFORMISTS.

TOLL, *tohl*, a tax or duty paid for the exercise of a liberty, privilege, or advantage; usually, a charge for use or enjoyment of a public service. One of the commonest forms of tolls was that which confronted every traveler over turnpikes in the United States and Canada, during the greater part of the nineteenth century. At regular intervals, a gate was placed across the road, to be raised only after the traveler had paid toll. The charge varied, that for a man on horseback being perhaps half that for a team and wagon, and usually five or ten cents. Such tollgates are still found in many parts of Europe, but they are now comparatively rare in North America. The proceeds of this tax are used to pay for repairs, thus making it possible to maintain fairly good roads, even in sparsely settled regions.

Another form of toll, still common in Europe, and apparently on the increase in America, is the bridge toll. Such tolls are paid to the owners of the bridge, sometimes a municipality, but more often a private corporation, and are seldom more than the equivalent of five cents per person for pedestrians, with a sliding scale for automobiles and their passengers. See TOLL BRIDGE; TRAILS OF EARLY DAYS.

Tolls are charged on a number of canals of international importance, including the Suez, the Sault Sainte Marie, and the Panama. The charges are moderate, based on ship tonnage, and are designed merely to pay the cost of maintenance and interest on the capital invested.

The fare charged by a ferryman is sometimes called a toll; so, also, is the fee, in cash or in grain, charged by a miller for grinding grain into flour.

Derivation. The word *toll* is derived from a Greek word for *tax*, and originally meant *something counted*; as tax-collectors had to count sheep and many other things, the idea of counting became associated with taxes. At first, any kind of a tax was a toll; later, it was only a special tax or charge for a service, as defined above.

TOLL BRIDGE. While the highways of the nation are built from public funds and are free to the public, the same thing cannot be said of bridges. The automobile has brought the toll bridge back into prominence. There are almost three hundred of such bridges on main-traveled highways in the United States, and others are being planned.

Frequently, when a state has built its main roads up to river intersections, it is unable to

finance the building of the necessary bridges. Crossing the rivers is left to ferries, which are of limited capacity and slow in operation. Private capital, seeing an opportunity for large returns, offers to build the bridges in return for the right to collect toll. The income from this source is amply sufficient to justify the large investment required. According to the Federal Bureau of Highways, the income from 233 toll bridges in one recent year was 11.7 per cent on the investment. This was net income, after all operating costs had been deducted.

Some of the bridges are even more profitable. For example, the publicly owned bridge over the Columbia River, at Portland, Ore., received in one year an income equal to twenty-nine per cent of the original cost of the structure.

One state, Kentucky, has legalized a plan to finance bridges by bond issues. Under this plan, when the tolls pay off the principal, the bridges are then to become free. While, under this system, the traffic still pays toll, it does so in the knowledge that it is paying only actual cost, and that there is a prospect of ultimate freedom.

There are now only nine states in which there are no toll bridges. Of the total number, more than two-thirds are privately owned. Some of them have been financed through the activity of chambers of commerce in the river towns, in order to divert tourist business their way. The average motorist will go miles out of his way to avoid a ferry. Hence a bridge may not only be profitable in itself, but may confer many indirect benefits on a community.

TOLLENS, *tol' enz*, HENDRIK. See NETHERLANDS, THE (Language and Culture).

TOLSTOI, *tahl stoi'*, ALEXEI. See RUSSIAN LITERATURE.

TOLSTOI (also spelled **TOLSTOY**), COUNT **LYOFF NIKOLAYEVITCH** (1828-1910), a Russian novelist, essayist, and moral philosopher, born at Yasnaya Polyana, in the province of Tula, September 9, 1828. His family belonged to the old Russian nobility, and the boy received every advantage of cultured environment. He was educated by French tutors and at the University of Kazan, but he was in constant revolt against the narrow views of the latter institution. Kazan was a center for Russian social festivities, and he spent most of his time in society, gradually assuming an attitude of contempt for academic learning. His inquiring mind, however, was beginning to assert itself.

Service in the Army. In 1847 he left the school, broken in health and disturbed



COUNT TOLSTOI
The Russian sage in peasant garb.

about his mental and moral condition. His parents had died while he was still a child. At home he found misery and rebellion among his serfs, and vainly undertook to bring happiness and prosperity again to his estates. Almost in despair, he gave himself up for a time to gambling and carousing, but his nature rebelled against dissipation, and in 1851 he entered the Russian army in the Caucasus, and spent much time in Cossack village garrisons, with an occasional military expedition into the mountains. In the midst of such conditions, he began to write. His first accepted story was a simple but sincere account entitled *Childhood*.

and was soon followed by *Boyhood* and *Youth*. These dealt with the scenes and incidents about his own home, but also showed clearly the influence of Rousseau—whose works he had read at Kazan—in their belief in an education derived largely from nature.

He next served in the Crimean War, and during the siege of Sebastopol wrote his famous *Tales from Sebastopol*. Then, weary of war and seeing absolutely no glory in bloodshed, the young man returned from the army and went to Saint Petersburg (now Leningrad).

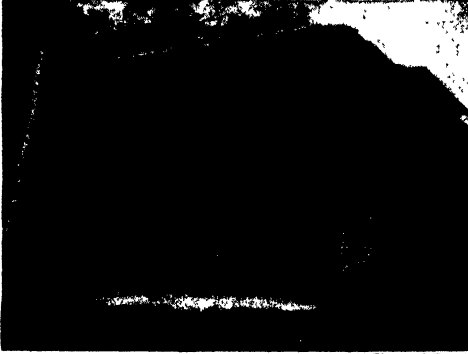


Photo: O R O C

THE HOME OF TOLSTOI

It was situated in a poor section of Moscow, and was typical of the simplicity of the life of Russia's great writer.

He found that his magazine stories had made a name for him among Russian authors, but his views on society, religion, war, and politics were so different from those held by other writers that he could not at that time name an intimate friend in all Russia.

New Theories. Between 1857 and 1861, Tolstoi visited Germany, France, and England, to see how common workmen fared in those countries, and returned home profoundly impressed with the belief that Russian social conditions were wrong. His serfs having been freed by the Emancipation Act of 1861, he settled on his estate as a magistrate, and opened a school where ideas of compulsion were never permitted. In believing that teaching should be adapted to the individuality of the pupil, Tolstoi foresaw the new theories only now being generally recognized. This aristocrat and rising author became a humble teacher of peasant children, and for nearly two years taught singing and drawing. The institution then closed, and he gave up his magistracy, because of the secret hostility of the government, and turned once more to his farm for consolation. In bitterness of heart against military and civil oppression, he wrote two violent stories, *Three Deaths* and *The Cossacks*.

His marriage in 1862 seems to have brought more peace of mind and concentration, and

soon afterward he began his greatest novels, *War and Peace* and *Anna Karenina*. The first, one of the masterpieces of the world's literature, deals with Russia between 1805 and 1815, and is a powerful indictment of warfare and the worship of "heroes." During his thirty-fifth year, his anxiety for the welfare of his fellow men increased. His *Death of Ivan* and *The Power of Darkness* reveal the change, for in those books his sympathy for suffering humanity is almost beyond his power of expression. Then came his rebellion against the Greek Orthodox Church, as shown in *A Confession* and *My Religion*. It appeared as though he were in revolt against religion, society, and civilization itself; but it was clearly only the longing of a noble heart to right wrongs.

Entered Upon Simplicity of Life. His married life for many years was both happy and prosperous, his farming successful, and his income increased by the sale of his books. Nevertheless, in 1880 Tolstoi renounced a life of ease, for ten years labored all day in the fields as an ordinary workman, ate no meat, gave up tobacco, allowed his hunting gun to rust, and lived what he called the life of simplicity. One night, in 1888, he announced to his family that the next day he would divide all his property among the poor and live a life of poverty; only after hours of pleading did his family persuade him to turn the entire estate over to his wife. Thenceforth he never had a penny of his own. He refused money for his writing, earned his living by farming and making shoes, and associated almost entirely with the peasants. He adopted the policy of non-resistance, and declared that Christ had enjoined such peaceful methods by his words "Resist not evil" (*Matthew* v, 39). Under those conditions, he wrote such masterpieces as *The Kreutzer Sonata*, one of the most vivid pictures of sordid life in all literature, *Master and Man*, *What Is Religion?*, and *The Resurrection*.

In 1901 he was excommunicated by the Greek Orthodox Church because of his teachings, and when he died, in a hut at Astapovo, where he had gone to avoid admirers, he was denied a religious funeral and a grave in a regular cemetery. Two questions which he ever sought to answer—*Why do I live?* and *How should I live?*—form the basis of most of his writings, and in his efforts to solve these problems, he produced literature that will always have a deep influence because of its sincerity, thoughtfulness, sympathy, and stern justice.

What Tolstoi Taught. It was not until 1844 that Tolstoi began to propagate his moral and religious beliefs, and found followers who became organized as a new sect. His religion was expanded in two works, *What I Believe In* and *A Short Exposition of the Gospels*. He

believed that God is not personal, but is the supreme *Good* and *Reason*; that Jesus was great, but not the only teacher of the truth; and that God and the Kingdom of God are "inside us." Man's aim in life, he believed, is to achieve happiness by doing right and avoiding all forms of evil. Believing that all forms of violence are wicked, he opposed conscription, or compulsory military service, as violence on the part of the State; but he also opposed revolution as evil, because it breeds hatred and violence.

He taught that love and compassion should be bestowed upon all living things, and that the social order can become better only when all men have learned to love and understand each other. He also prescribed vegetarianism and abstinence from intoxicants, drugs, and tobacco. He was bitter in denouncing the wealthy and all forms of capitalistic monopoly; and the opposition to military service which he taught caused many of his followers to be imprisoned or banished to Siberia.

Other Works. Besides the works mentioned above, Tolstoi's published works include *The Story of Yesterday*, *Two Hussars*, *The Memoirs of a Madman*, *Father Sergius*, *The False Coupon*, *The Devil*, and *What Is Art?* The last-mentioned is one of the most remarkable books ever written on the well-worn subject.

Tolstoi also wrote several powerful plays, including *The Power of Darkness* and *The Living Corpse*; and a light comedy, *The Fruits of Enlightenment* satirizing the fads of so-called "society."

TOLTS. See NEWFOUNDLAND (Physical Features).

TOLUENE. See COAL TAR (Derivatives).

TOM, MOUNT. See MASSACHUSETTS (The Land).

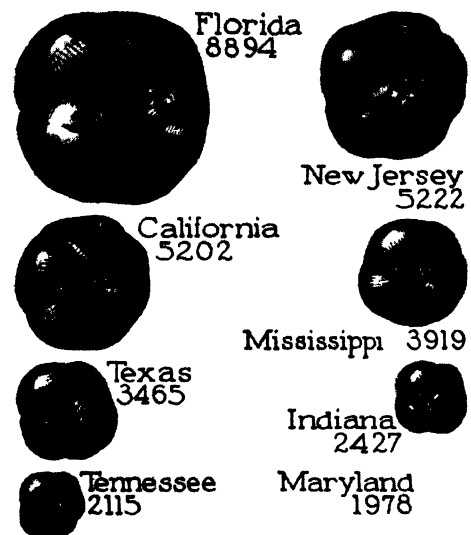
TOMAHAWK, originally, a war club or hatchet, used by the North American Indians. In early times, tomahawks were clubs of deer horn or stone, attached by cords of skin to wooden handles. When the Europeans formed alliances with the Indians, they introduced a new kind of tomahawk which could be used either as an implement of warfare or as a tobacco pipe. The handle formed the stem, and the blunt side of the hatchet head was hollowed out to hold the tobacco. Tomahawks were employed in close conflicts, or were thrown with great skill from a distance, so that the sharp edge of the hatchet would strike the enemy.

[The phrases *burying the hatchet* and *digging up the hatchet*, Indian expressions which have been Americanized, are equivalent to *making peace* and *declaring war*.]

TOMATO, *toh ma' toh*, or *toh mah' toh*, a fruit which is always regarded as a vegetable, and is eaten either raw or cooked. It belongs to the same family as the potato, the eggplant,

the tobacco plant, belladonna, and jimson weed. It is interesting to note that, while the valuable part of the tomato plant and the eggplant is the seed pod, or fruit, the edible part of the potato plant is its tuber, and the only usable part of the tobacco plant is its leaf.

The tomato was originally native to South America, probably Peru or Brazil, and was first introduced into Europe and North America as a decorative plant of the flower garden, the fruit being known as the *love apple*. It was



Figures Represent Thousands of Dollars.

Average value of the tomatoes grown in a year in the six leading centers of production.

not until early in the nineteenth century that people discovered that it was good to eat, and began using it as a food. Previously, it had been considered poisonous, for the leaves and other green parts are sometimes found to be quite poisonous. The fruit was then much smaller, was irregular in shape, and wrinkled; scientific cultivation, breeding, and selection were necessary to produce the round, red, smooth, and firm tomato of to-day. There are more than 150 varieties on the market.

Tomatoes are very sensitive to frost, but otherwise they are easy to cultivate. The seed should be planted indoors under glass; the young plants are transplanted to the field or garden as soon as the frost is out of the ground. If set about three and a half feet apart, the plants will have room to develop without crowding, and will give opportunity for clean cultivation. If the plants are tied up and trained on stakes or a trellis, they will grow often to a height of six feet. If, in addition, the vines are pruned to one or two stems and

the fruit is kept off the ground, the yield is increased.

Food Value. Though tomatoes contain so much water that they have low fuel value (see CALORIE), they are among the most important of the regulatory foods, because they are rich in mineral salts and vitamins (which see). Furthermore, tomato vitamins are not destroyed by cooking, and are present in the canned product. When oranges are not available, young children should be given tomato juice, the specialists say. Tomato juice "cocktails" are now served in most restaurants. Tomatoes are attractive in appearance and flavor, and though they were originally thought to be poisonous, they have won a place in practically every American household. They can be served fresh as salad, stewed or broiled, used for soups, and cooked with macaroni and other foods. Sauces, pickles, and relishes are made from tomatoes, both green and ripe, and large quantities are canned. In America, Maryland and New Jersey are the leading states in tomato-canning. See FOOD PRODUCTS, PRESERVATION OF. B.M.D.

Scientific Name. The tomato belongs to the family *Solanaceae*. Its botanical name is *Lycopersicon esculentum*.

TOMB, toom, any chamber wherein the dead are buried, whether hollowed out of the rock or built above ground. Often a tomb is a combination of these types. Like most burial customs, the use of tombs among the ancients was originally an outgrowth of a belief in the immortality of the soul. The Egyptians, for instance, believed that a man's *ka*, or double, haunted his burial place, waiting its time to reinhabit the body, and they consequently carved or painted on the walls of their tombs objects in which the deceased had been interested. Tombs were very common among the Egyptians, as indeed they were among almost all Oriental peoples. The pyramids are the most impressive examples of their peculiar form of sepulchral architecture, but no less interesting are the tombs hewn in the rocks, with their numerous chambers and labyrinthine passages.

The Jews made use of such rock burial places; Christ was placed in a new rock sepulcher belonging to Joseph of Arimathea.

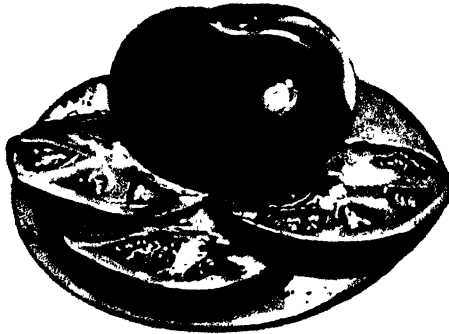
The Greeks, too, made use of both types of tombs, the older form being the rock-hewn.

Their raised tombs were, for the most part, very simple affairs, although in the colonies in Asia Minor, very elaborate structures existed. The most famous of these, accounted one of the Seven Wonders of the World, was the tomb of Mausolus, at Halicarnassus in Caria, from which the word *mausoleum* is derived. The Romans gave far more attention than did the

Greeks to the erection of memorials to the dead, and along the Appian Way were numerous tombs. On the Vatican side of the Tiber may be seen to-day the great circular tomb of Hadrian, now called the Castle of Sant' Angelo. Other Roman cities, too, had streets lined with tombs, as has been shown by the excavations at Pompeii. A special type, developed in some parts of Italy, consisted of numerous niches hewn into the rock, wherein were placed all the dead of a family, or

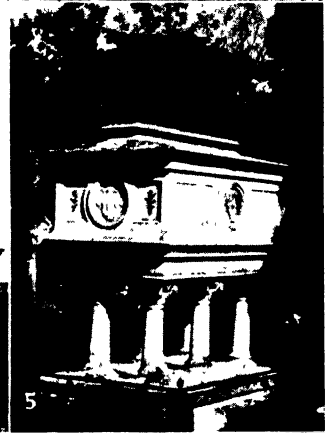
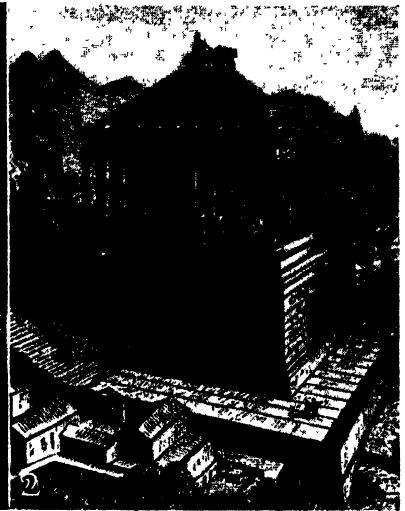
even of a small community; these were known as catacombs. The Mohammedans made much of sepulchral architecture, taking as their favorite form the circular, domed tomb, which they modified and elaborated until it resulted in such exquisite structures as the Taj Mahal, perhaps the most beautiful building ever erected.

In the Middle Ages, burial in churches became common, and the most important tombs of the period are to be found there. These memorials were of various forms, but the favorite was a stone coffin or sarcophagus, on which rested a recumbent figure of the deceased, the whole surmounted by a canopy of great elaborateness and beauty. In modern times, tomb



THE TOMATO

In the upper illustration, a blossom and well-formed fruit are seen on the same vine.



Some Famous Tombs. (1) Francis I of France, at Nantes. (2) Mausolus, at Halicarnassus; from his name is derived the modern word mausoleum. (3) Beethoven, in Vienna. (4) The Invalides, Paris, where Napoleon Bonaparte's tomb may be seen. (5) Elizabeth Barrett Browning, Florence, Italy. (6) Strauss and Brahms, in Vienna.

architecture has declined, until there is seldom seen a structure which really merits great admiration. The most impressive public monument of this kind in the United States is the tomb of General Grant, on Riverside Drive, in New York City.

Related Subjects. The reader may consult, in this connection, the following articles in these volumes:

Archaeology
Burial
Catacombs

Coffin
Cremation
Embalming

Epitaph
Immortality
Mummy
Pyramids
Sarcophagus
Taj Mahal
Towers of Silence
Westminster Abbey

For illustrations of numerous tombs of note, see the following articles:

Bonaparte, Napoleon
Grant, Ulysses S.
Hadrian
Lenin, Nikolai
McKinley, William
Seven Wonders of the Ancient World
Unknown Soldier
Washington, George
Wilson, Woodrow

TOMBIGBEE RIVER, a stream which rises in the northeastern corner of Mississippi, winds south and southeast through Alabama, and joins the Alabama River. These two rivers unite to form the Mobile River (which see). A considerable part of the Tombigbee's length of 450 miles is navigable. Its largest tributary is the Black Warrior. See **MOBILE, ALA.**; **ALABAMA** (Rivers and Forests); **MISSISSIPPI** (Physical Features).

TOMSK. See **SIBERIA**.

TOM THUMB, locomotive. See **COOPER, PETER**.

TOM THUMB. See **BARNUM, PHINEAS T.**; **DWARF**.

TOMTIT. See **TITMOUSE**.

TOMYRIS, a Scythian queen. See **CYRUS** (The Great).

TON, *tun*, in the English system, a measure of weight and capacity, equal to twenty hundredweight. In Great Britain and America, a standard hundredweight is equal to 112 pounds, and the ton is therefore equal to 2,240 pounds.

In America, however, a ton of 2,000 pounds is in common use, the heavier ton being known as the *long ton*, and the lighter as the *short ton*. By United States law, a ton must contain 2,240 pounds, unless otherwise specified. United States customhouses always weigh by the long ton. Coal and iron ore are weighed and sold at the mines by the long ton, but coal is bought by consumers by the short ton. As the wholesalers lose something by waste and shrinkage in

transportation and handling, this difference in ton standard practically covers the loss. See **TONNAGE**.

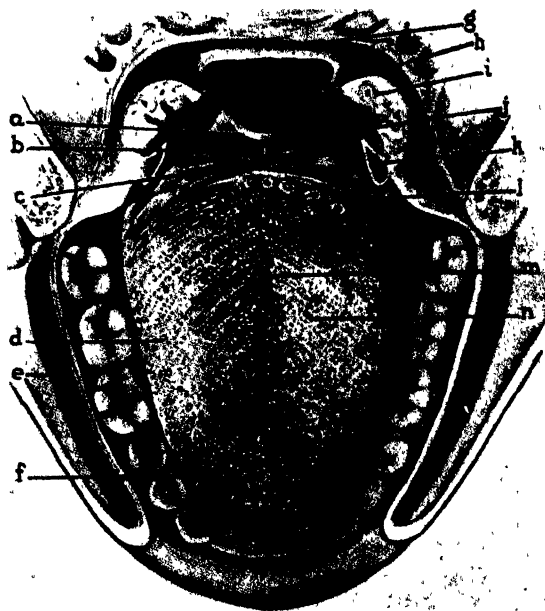
TONE, a musical term denoting the sound made by the vibrations of a piano, violin, harp, or other musical instrument, or by the human voice. Tones differ from one another in quality, pitch, intensity, and duration. The word *tone* is also applied in music to the larger intervals in the diatonic scale, as distinguished from the semitones, or smaller intervals. For fuller information, see **MUSIC** (Common Musical Terms).

TONEGAWA RIVER. See **JAPAN** (Waters).

TONGA ISLANDS. See **PACIFIC ISLANDS**.

TONGASS NATIONAL FOREST. See **ALASKA** (Animal and Plant Life).

TONGUE, *tung*, a flat, muscular organ in the mouth, which serves as the principal organ of taste and is an important aid in the formation of sounds and in the process of chewing and swallowing. The tongue, which is composed of striped-muscle fibers, running in various directions, is attached to the hyoid bone at its root end; by virtue of this arrangement, one can move the front part in many different ways, and use it to stir the food about, push it between the teeth, collect it into small masses, and thrust it back into the passage leading to the stomach. The relation of this organ to speech is empha-



THE TONGUE

The view is that of the upper surface and surrounding anatomy
(a) Epiglottis
(b) Frenulum epiglottidis
(c) Pharyngeal portion
(d) Fungiform papilla
(e) Muscle of the cheek (buccinator)
(f) Fungiform papilla
(g) Superior constrictor muscle
(h) Posterior palatine arch
(i) Tonsil
(j) Pharyngo-epiglottis
(k) Anterior palatine arch
(l) Circumvallate papillae
(m) Roof of tongue
(n) Conical papillae

sized in numerous proverbs which have references to the "wagging tongue," the "tongue hung at both ends," "an unruly member," etc.

The tongue is covered with mucous membrane, which, on the dorsum, or upper surface, has numerous tiny conical elevations called *papillae*. These give the organ its rough feeling. The papillae at the back of the tongue contain the taste buds. Besides muscles and taste buds, the organ has glands which secrete mucus, a moistening fluid. In ordinary health, the tongue is a pinkish-red color, but when the digestion is impaired, a yellowish coating generally forms. In some diseases, it becomes a bright strawberry-red. Physicians can often tell much about the patient's condition by looking at his tongue. K.A.E.

Related Subjects. For additional information, see the following articles:

Mouth Taste
Mucus Voice

TONIC, *tahn'-ik*, a medicine or other agent that has the power to strengthen, or "tone up," the system. In general, tonics act by promoting nutrition or increasing resistance, and their action may be direct or indirect. That is, some tonics directly stimulate the stomach, heart, or other organ, and others help to correct unhealthful conditions which interfere with bodily vigor.

Medicinal Tonics. These are named according to the special action they are expected to have, as blood tonics, nerve tonics, stomachic tonics, etc. Iron, quinine, strychnine, and vegetable bitters are standard nerve tonics; digitalis and squill are especially valued as heart tonics; arsenic and cod-liver oil are often prescribed for anaemia; and nux vomica is believed to be beneficial to the stomach.

Non-Medicinal Tonics. These are also called general tonics, and they include baths, fresh air, exercise, massage, and the like. In connection with this subject, it should be stated that when a person feels the need of a tonic, he should consult a physician before taking

any drug. Especially should he avoid the numerous patent medicines advertised as blood-purifiers, nerve stimulants, etc.

Related Subjects. The reader will find further information on the subject in the following articles:

Arsenic
Baths and Bathing
Bitters
Cod-Liver Oil
Digitalis
Life Extension

Medicine and Drugs
Nutrition
Nux Vomica
Quinine
Squill
Strychnine

TONIC (music).

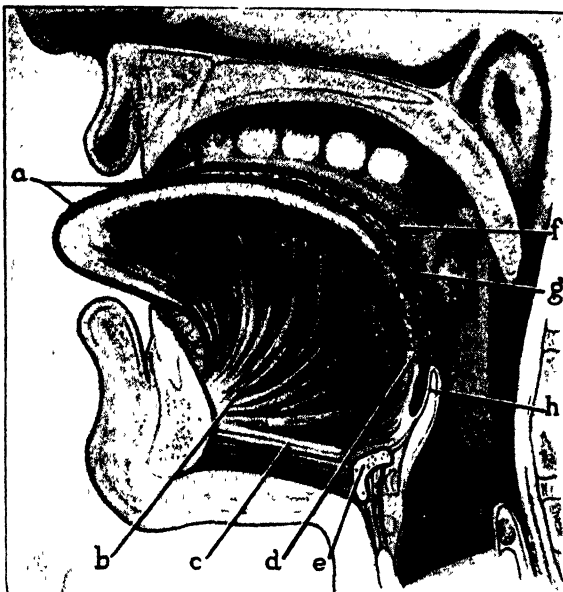
See **KEY**.

TONKING. See **FRENCH INDO-CHINA**.

TONNAGE, *tun' ayj*, the carrying capacity of a ship, measured in cubic-feet tons. The gross tonnage contains 100 cubic feet to the ton (see the article **TON**), and this is the unit of measurement used in assessing dock and harbor dues and in fixing the fee for towing. Gross tonnage is ascertained by dividing the volume (number of cubic feet) of the interior of the ship's hull and deck houses by 100. On freighters, forty cubic feet of merchandise are regarded as a ton, unless the amount

should happen to exceed 2,000 pounds, in which case payment is by weight. To accommodate a rapidly expanding traffic in ore, coal, and grain on the Great Lakes, American builders have produced vessels of enormous tonnage, which are capable of carrying over 16,000 gross tons.

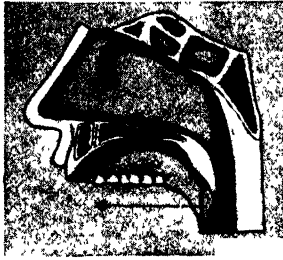
The relation between the tonnage and the size of a ship is not easily explained, but an example may be enlightening. Thus, an ordinary cargo steamer, capable of carrying about 8,000 tons of freight, fuel, and stores, will have a displacement (weight) of 11,500 tons, a gross tonnage of about 5,200, and a net or registered tonnage of about 3,200. In the case of large, fast liners, with much space occupied by machinery, the net tonnage may be as low as fifty per cent of the gross. The tonnage of some of the world's great passenger vessels is given in the article **SHIP**.



THE TONGUE
Viewed from the side.

- | | |
|---|---------------------------|
| (a) Papillae | (e) Hyoid bone |
| (b) Flat triangular muscle (genioglossus) | (f) Taste buds |
| (c) Geniohyoid muscle | (g) Glands in soft palate |
| (d) Lymphoid follicle | (h) Epiglottis |

TONSIL, *tahn' sil*, a soft, almond-shaped body lying in the back of the mouth, in front of the pharynx. There are two tonsils, one on each side of the throat. These organs seem to have no special purpose, and when they become inflamed, they are a source of pain and annoyance. Not only do diseased tonsils cause tonsillitis and quinsy (both of which see), but they are often the seat of infection from which germs may spread, producing rheumatism and other ailments. The tonsils may be removed without danger, and such removal is advisable if they are permanently affected. See EDUCATION (Hygiene of Education).



A TONSIL

The right tonsil is shown at *a*. The tonsils may be removed without danger, and such removal is advisable if they are permanently affected. See EDUCATION (Hygiene of Education).

K.A.E.

TONSILLITIS, *tahn sih li' tis* (less correctly spelled TONSILITIS), is a painful disease resulting from inflamed tonsils. It is caused by lodgment of disease germs in one or both of the tonsils. Overwork, taking cold, and dissipation are some of the predisposing causes. Attacks of tonsillitis are most common in persons between the ages of ten and forty. An attack begins with swelling and pain in the throat, and difficulty in swallowing. Fever, violent headache, backache, stiff neck, and nausea occur as symptoms in severe cases, and if an abscess forms in the throat, the attack develops into quinsy (which see).

Tonsillitis is not usually fatal, but many recurring attacks tend to make the tonsils permanently diseased, and in that case they are a source of danger to the health. Such tonsils should be removed (see TONSIL). Mild cases of tonsillitis usually yield to rest in bed, hot or cold compresses on the neck, and the administration of purgatives, but a serious attack should have the attention of a reliable physician.

W.A.E.

TONSURE, *tahn' shure*, the cutting or shaving of the hair to denote dedication to clerical or monastic life. In the Roman Catholic and Greek Churches, the act is one of preparation for receiving Holy Orders, and is performed by the bishop. Clerical tonsure was mentioned as early as the fifth century, and in the Middle Ages the practice became universal. Various modes of cutting the hair were adopted in different countries; the *tonsure of Peter* left only a ring of hair around the head, as a symbol of Our Lord's crown of thorns and an emblem of the Roman priesthood; the *tonsure of James*, prevailing in Britain, consisted in shaving the front part of the head from ear to ear. This form of tonsure

was the cause of bitter strife between the followers of Saint Augustine and the monks he found in Britain, when he went on his mission to that country. In the Greek Church, formerly the whole head was shaven, but tonsure now consists in cutting the hair close.

TONTO MONUMENT. See MONUMENTS, NATIONAL.

TONTY, OR **TONTI**, *tohn' te*, HENRI DE (about 1650—about 1704), an Italian explorer, the trusted companion of La Salle in the exploration of the Mississippi Valley. He was born in Gaeta, Italy, but joined the French army and saw considerable service. In 1678 he accompanied La Salle to Canada, and two years later went with him on his expedition into Illinois. When Fort Crèvecoeur, near Peoria, Ill., was built, Tonty was placed in command, but after La Salle's departure his soldiers mutinied, and he retraced his route toward Canada, wintered at Green Bay, and met his leader at Michilimackinac (Mackinac Island), in the spring of 1681. Tonty was also with La Salle in his great voyage down the Mississippi River, and afterward was in charge of Fort Saint Louis, the stronghold erected at Starved Rock (see pages 3355, 3357).

Tonty was the leader of the Illinois Indians in a campaign against the Senecas, and identified his life with that of the former tribe until 1702. In 1686 he undertook an expedition down the Mississippi to aid La Salle, but did not succeed in finding him. After 1702 he joined Iberville in Louisiana. Every report of Tonty which has been preserved speaks of him in terms of highest praise, and his influence with the Indians seems to have been as beneficial as it was strong. See IBERVILLE, PIERRE LE MOYNE; LA SALLE, RENÉ R.

TONY SARG. See SARG, TONY; DRAMA (Puppets).

TOOMBS, *toomz*, ROBERT (1810-1885), an American lawyer, orator, and statesman, member of the Confederate Congress and of the Confederate Cabinet, and a Southern brigadier general. He was born at Washington, Wilkes County, Ga., attended Franklin College (University of Georgia), and was graduated at Union College, Schenectady, N. Y., in 1828, and at the law school of the University of Virginia. Not long after admission to the bar, in 1830, he became one of the leading lawyers of Georgia. When the Creek Indian War broke out in Alabama, in 1836, he recruited a volunteer company and served as captain under General Winfield Scott. After serving in the Georgia legislature and the House of Representatives, he was elected to the United States Senate in 1853, and a year later ardently supported the Kansas-Nebraska Bill.

As an advocate of secession, Toombs withdrew from the Senate after Lincoln's election,

and became a member of the Confederate Congress. President Davis also made him Secretary of State, but he resigned to accept an army commission as brigadier general in the Army of Northern Virginia, and later became inspector general of a division of Georgia militia. After the war, Toombs spent two years in exile in Cuba, France, and England, returning in 1867 to Georgia, where he practiced law until his death.

TOOTHACHE TREE. See PRICKLY ASH.

TOPAZ, *toh' paz*, a lustrous mineral composed principally of aluminum, silicon, and fluorine, and occurring chiefly in granite and gneiss. It is often a valuable indicator of the presence of tin ore. In hardness it ranks between sapphire and quartz. Crystallized, transparent varieties are prized as gem stones, especially the colorless and yellow topazes. Red, blue, and green stones also are found. The best specimens of gem topaz are taken from the Ural Mountains; they are found also in Brazil, India (including Ceylon), Maine, Colorado, and Utah. The pure-white topaz, when cut and polished, resembles the diamond; the great *Braganza diamond*, one of the Portuguese crown jewels, is probably one of these stones. The finest yellow topaz comes from Brazil; when heated, these stones turn pink, and are called *Brazilian rubies*. To the topaz the ancients attributed power to cure dimness of vision and to dispel gloom, and it is regarded as a peculiarly "lucky stone" for those born in November.

"Firm friendship is November's and she bears
True love beneath the topaz that she wears"

The so-called *oriental topaz* is a variety of corundum (which see). T.B.J.

TOPEKA, *toh pe' kah*, KAN., is the state capital and the county seat of Shawnee County. It is situated on the Kansas (Kaw) River, sixty-five miles west of Kansas City, and is in the midst of the fertile Kaw Valley, near the geographical center of the United States. It is a busy commercial and industrial center, and an attractive residential city, with a noticeable lack of poor districts. The state capitol, a fine stone building surrounded by attractive

park space, is the dominant architectural feature (see panel illustration with the article KANSAS). Population, 1928, 62,800 (Federal estimate).

The average elevation of Topeka and its vicinity is 1,000 feet above sea level. An adequate water supply is furnished the city through municipally owned filtration plants. Natural gas is used for all possible purposes, including domestic heat. Electric current is supplied by a new 110,000-horse-power generating plant, located east of the city. There are

eighteen parks, and 330 miles of paved streets.

Topeka was founded in 1854 by a few anti-slavery settlers from the free states. Starting with seven inhabitants, it has enjoyed a steady and substantial growth. The city was incorporated in 1857, and was chosen as the state capital in 1861. It has the commission form of municipal government.

Railroads. Topeka is served by the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the Missouri Pacific, and the Union Pacific railroads. It is the headquarters of the Santa Fe.

Industry. Over 5,000 people are employed in the general offices and shops of the Santa Fe system. The railroad shops, which are among the largest in the world, cover 215 acres, and the shop workmen number about 2,300. There are over 200 manufacturing plants, the leading industries being flour-milling, meat-packing, and printing and publishing. The iron and steel products are important; so, also, are creamery products, the city being in the center of a rich dairy country. There is also an airplane factory, and coal is mined in the vicinity.

Education. Topeka is the seat of Washburn College, a coeducational school with over 1,000 students, and Bethany College, an Episcopal school for girls. Mulvane Art Museum, on the Washburn campus, houses valuable permanent collections, besides traveling exhibits during the winter months. R.A.B.

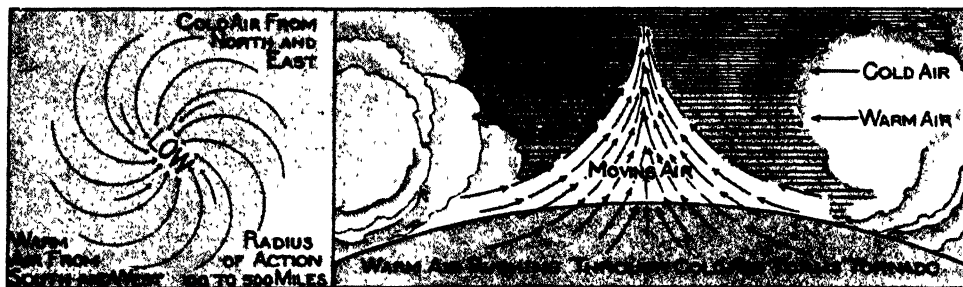
TOPLADY, AUGUSTUS MONTAGUE (1740-1778), an English clergyman, author of one of the most popular of all hymns, *Rock of Ages* [see HYMNS AND HYMN TUNES (Ten World-Famous Hymns)]. He was born at Farnham, studied at Trinity College, Dublin, and in 1764 was ordained a priest in the Church of England. In 1768 he became rector of Broad Hembury, and this post he filled until 1775,



Photo P & A

THE LARGEST TOPAZ

Found in the mines of Brazil, and now in the Smithsonian Institution, Washington, D C The specimen weighs ninety-five pounds, and contains 25,000 carats. Its value in the rough is about \$3,000.



HOW TORNADOES ARE FORMED

when ill health made necessary his removal to London, where he died. He wrote many controversial works, and was regarded as a champion of Calvinism, as opposed to the Methodism of Wesley.

TOPOGRAPHIC CHART. See CHART.

TOQUILLA, a fiber from which Panama hats are made. See COLOMBIA (Mining and Manufactures).

TORII, *toh' rih e*. See color plate, JAPAN; SUPERSTITION, page 6937.

TORINO, *toh re' no*, the Italian name for Turin, Italy. See TURIN.

TORNADO, *tawr na' doh*, a violent whirling storm which occurs with greatest frequency in the central part of the Mississippi Valley, usually in the months of May, June, and July. Tornadoes also occur occasionally in Canada, in Australia, and in some parts of Europe. No atmospheric disturbance known is more violent than the tornado; the record of twenty-five of these storms shows that they caused a damage to property of \$15,000,000 and the loss of 1,500 lives. About 100 of these storms occur in parts of the United States annually, though not all of them cause widespread damage. In popular language, tornadoes are often called *cyclones*, but the word *cyclone*, scientifically speaking, is a term for quite a different type of storm. *Tornado* is a Spanish word meaning *twister*.

Tornadoes usually form within thunderstorms, and they occur on warm days, when the humidity of the air is excessive. The tornado cloud is a densely black, funnel-shaped mass, pointing downward from dark storm clouds in violent commotion. This funnel-shaped cloud is the storm center, and the velocity of its whirling movement is thought to be 400 or 500 miles an hour, in some cases. The condition giving rise to such a cloud may be described as a condition of unstable equilibrium in the atmosphere, with a warm layer of humid air next to earth, and a cooler layer above it. A disturbance in the atmosphere causes an upward current in the warm air, and as the current rises, a rotary movement is caused by the inrush of cold air from surrounding areas. The whirl is so rapid at the center that a

small area of low pressure is produced, the temperature is reduced, and condensation of moisture takes place; thus the cloud is formed. One often sees miniature tornadoes in open spaces on a hot afternoon, in little whirling eddies of dust. Waterspouts at sea are similar to land tornadoes.

Nearly all of these storms move in an easterly, and generally in a northeasterly, direction. They usually travel at the rate of forty or fifty miles an hour, but velocities of 100 miles per hour have been recorded. The destructive power is not in the straight wind, but in the rotating mass, which whirls counter-clockwise. Though the path of the storm may be only a few rods in width, within that path buildings are torn down, trees are uprooted, heavy bridges are swept away, and locomotives are lifted from the track. Tornadoes rarely occur in regions which are mountainous to any degree, or where there is little moisture in the atmosphere. Barometric pressure in the vicinity of a tornado falls very rapidly.

The United States Weather Bureau does not forecast the occurrence of these storms, because it is impossible to predict their exact location. Meteorologists give the following advice:

If a tornado cloud is seen advancing, get into a "cyclone cellar," if there is one. In a frame house, go to the southwest corner of the basement, as such a house is likely to be removed from its foundations intact. In a brick or masonry structure, the basement is the most dangerous place, since the tornado will rip such a house to pieces and whirl the debris into the basement.

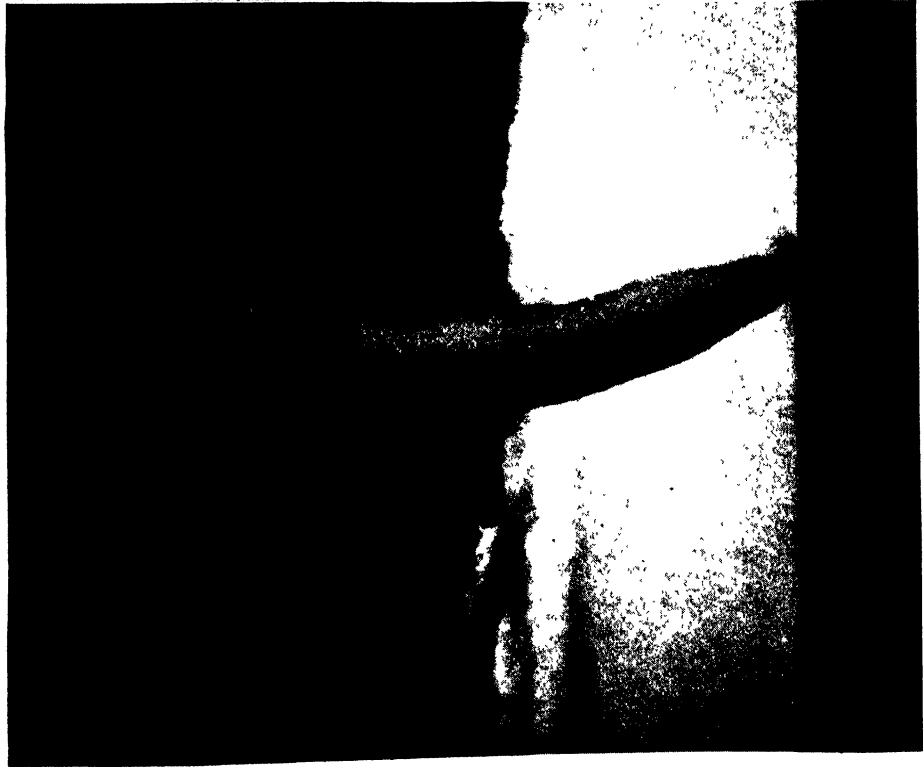
R. H. W.

Related Subjects. In connection with this discussion of the tornado, the reader may consult the following articles in these volumes:

Cyclone
Hurricane
Monsoon
Storms

Typhoon
Waterspout
Whirlwind
Wind

TORNEA RIVER, a stream that forms the boundary between Sweden and Finland. It has its source in a lake of the same name, and runs a course of about 250 miles, in a general southerly direction. See SWEDEN (Rivers and Lakes).



A Tornado in Action. The ominous funnel-shaped cloud sweeps across the country, and in its narrow path leaves ruin behind. At the right, a rare picture, which shows the funnel lowering toward the ground.

University of Toronto



TORONTO, *toh rahn' loh*, ONT., the capital and largest city of the province, and, except Montreal, the largest city in the Dominion of Canada. It lies on the north shore of Lake Ontario, near its western end. By rail, Toronto is 334 miles southwest of Montreal and thirty-seven miles east of Hamilton. It is forty-one miles due north of the mouth of the Niagara River. Population, 1926, 556,691.

The harbor, which was originally responsible for the growth of the city, is picturesque. A sandy island, which converts the Bay of Toronto into a natural landlocked harbor, has many attractive spots, and shelters hundreds of canoes, launches, and yachts. Toronto, in fact, is noted for its aquatic sports, made possible by this natural harbor. The harbor is of tremendous commercial importance, and after the organization of the new Harbor Board, in 1911, plans were adopted for the expenditure of approximately \$24,000,000 for the purpose of improving the water front. These plans included the construction of massive sea walls and new docks, deepening of the harbor, development of a new industrial district immediately east of the harbor, and the creation of a boulevard and park system across the water front. The city is served by all the transcontinental railways of Canada, and is headquarters for the Canada Northern.

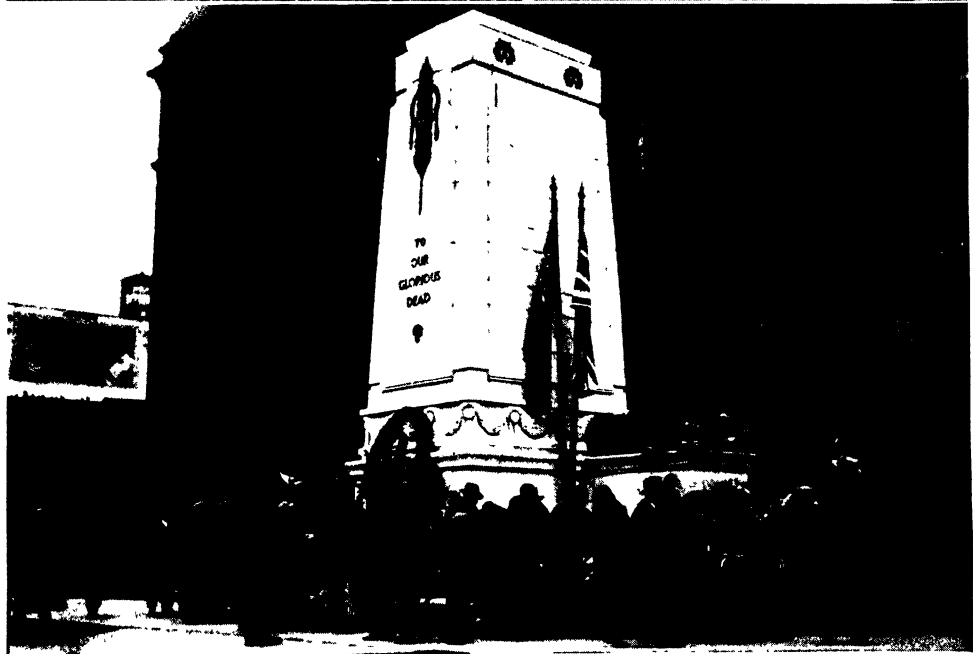
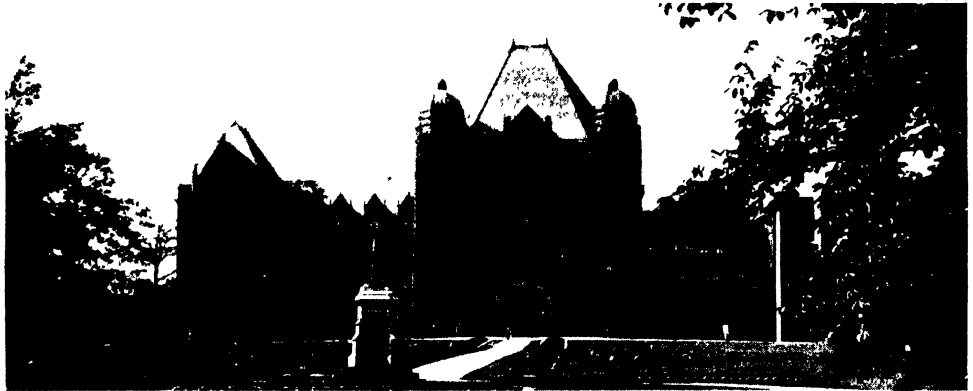
Public Buildings and Other Features. Toronto may well boast of its public buildings. The most conspicuous downtown structure is the city hall, on Queen Street. It was completed in 1899, eight years after the laying of the cornerstone, and cost about \$2,500,000. Its massive tower, 300 feet high, holds a clock which is said to be the largest winding clock in North America. First in importance and appearance, of all of the city's buildings, is the Parliament House, in Queen's Park, beautifully situated and of an imposing character, with the large and beautiful Whitney block, opened in 1928, immediately opposite. Not less imposing are the buildings of the University of Toronto. A new Union Station

was completed in 1927. There are sixty-nine parks, with a total area of 2,065 acres. A large industrial exposition is held each year, for a fortnight in late summer, in Exhibition Park, which includes 240 acres.

Commerce and Industry. Toronto is Ontario's chief commercial center. The city is the leading wholesale jobbing center in the Dominion, its trade in dry goods and shoes being especially noteworthy. Some of these goods are imported from the United States, but the largest part are made in Canada. The city is an insurance exchange, and its bank clearings are exceeded in the Dominion only by those of Montreal. It is noted for its department stores, one of which is the largest of its kind in the British dominions.

In manufactures, Toronto was for years a close second to Montreal, but recently, for a number of years, has taken first rank. It has more than 3,300 manufacturing establishments, its yearly output being about one-eighth of Canada's total. It is the great slaughtering and packing center of Canada, and it has a large output of machinery, lumber, books, and various iron and steel products, including rails and stoves. The shipbuilding yards are also important. The city's largest establishments make agricultural and other machinery. Power for all these plants is derived entirely from Niagara Falls, through the management of the Ontario Hydroelectric Commission. Light and heat for the city are obtained from the same source.

Institutions. With one church for approximately every thousand of total population, Toronto is often called "the city of churches." There are two cathedrals—Saint James, Anglican, and Saint Michael's, Roman Catholic. The city is the educational center of the Dominion. In fact, excepting the Parliament building, the city's most conspicuous buildings are those of the University of Toronto and its affiliated institutions, and the beautiful Gothic structure of Victoria University. In addition, there are McMaster University



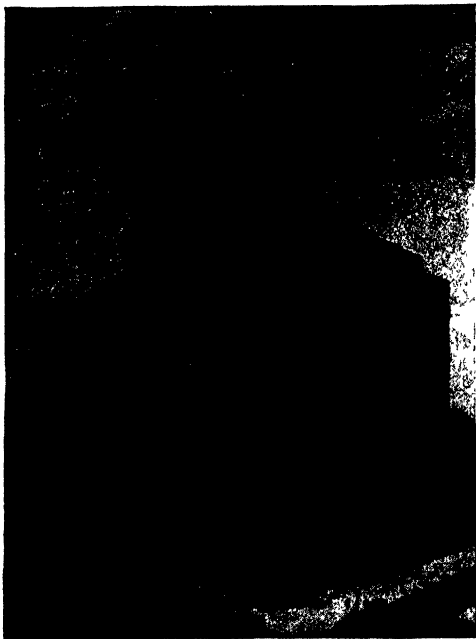
In Ontario's Capital City. At top, Toronto public library. Center, provincial House of Parliament, with Queen's Park in the foreground. Below, Toronto's cenotaph, erected in memory of Ontario's dead in the World War.

(Baptist), Trinity College (Anglican), and Upper Canada College, the oldest secondary school in the Dominion. The Technical School, erected at a cost of \$2,500,000, is one of the best-equipped schools on the continent. The public library, the largest in the Dominion, with its seventeen branches, many of them in beautiful buildings, has a prominent part in the education of the people, and there are about 150 public and separate schools.

Toronto is also the Canadian center for education in the arts. It is the home of the Ontario Society of Artists and of the Canadian Art Club, and it has a flourishing art school and a large number of musical schools.

There are seventy-two hospitals, asylums, and other benevolent institutions, the largest being the Toronto General Hospital, which in 1927 accommodated 15,000 patients.

History. The name *Toronto* is of Indian origin. It means *a place of meeting*, and was probably given to the site because it was a rendezvous for Indian councils or war parties, long before the coming of the white man. It was then the end of the shortest and most convenient route between Lake Huron and Lake Ontario. During the seventeenth and eighteenth centuries, the history of Canada



ROYAL YORK HOTEL

was the record of a struggle between the French and the British for the fur trade. The French control of the Niagara River route led the English to establish Fort Oswego, which was to attract trade from the Northwest. The French countered by building Fort

Rouille, in 1749, on the site of Toronto. In 1793 the fort was destroyed, to prevent its use by the English.

Finally, in 1794, Governor Simcoe chose the site for the capital of Upper Canada, and named



THE CITY HALL, TORONTO

the new settlement York. It was captured by the Americans in 1813, and some of its public buildings, including the archives, were burned. In 1834, having acquired a population of 10,000, York was incorporated as a city, and its name changed to Toronto. The city government is vested in a council consisting of the mayor and four controllers, who are elected annually, and twenty-four aldermen, three from each of the city wards. Education is under the control of an elected board.

G.H.L.

TORPEDO, OR ELECTRIC RAY, a ray found in warm seas, so called because it can apparently discharge electricity from special organs lying in the head and gill region. Its body is flat and broad, dark above and white below, and ends in a slender tail. The torpedo uses its strange power to kill small fish for food; in a full-grown, healthy fish, the shock is powerful enough to disable a man. After discharging electricity, the fish is temporarily exhausted. The exact way in which the electric organs become charged is not well understood. See **ELECTRICAL FISH**.

L.H.

Scientific Name. The torpedo of the North Atlantic coast, known also as the cramp fish, is *Tetronarce occidentalis*.



The STORY of TORPEDOES

TORPEDO, an underwater weapon used in naval warfare for the purpose of destroying enemy vessels. Its name is derived from the Latin *torpere*, meaning *to be asleep* or *numb*, and was adopted possibly by analogy with the *torpedo* fish, or electric ray, which is capable of giving a severe shock. In several wars, within recent years, the effectiveness of torpedoes has been demonstrated, but never before with such dreadful and deadly certainty as in the World War. It was one of the cruellest weapons of that war, and to meet the demands for an instrument of the highest efficiency, it was improved within two years by the German naval establishment from a comparatively small, though powerful, device to an undersea terror weighing a ton and a half. In its evolution, the cost of the torpedo rose from about \$3,000 to over \$8,000 for the largest sizes. When considered from the viewpoint of dimensions, it is the most complicated and the costliest piece of mechanism ever devised to kill men and to destroy property.

The Wonders of the Invention. The inventive genius of man would seem to have reached the apex of achievement in the torpedo of the present day. At a depth of eight or ten feet below the surface of the ocean, it travels as fast as the speed of a passenger train, and this requires a powerful engine, or motor, intricate in detail. For the most effective results, the torpedo must possess mechanical means of maintaining a certain level. It must also be so constructed that it will keep a straight course ahead; this is accomplished by means of a gyroscope, which will bring it back to its course if deflected. In the head of the torpedo there must be an explosive charge powerful enough to tear a hole in the massive steel sides of great merchant vessels or of the mightiest warships.

When these necessary elements are considered, it is evident that a modern torpedo is an oddly formed submarine ship, which conducts itself with almost human intelligence, runs itself, stabilizes itself, and guides itself—all without the touch of man, after it has been dispatched on its mission.

The first successful automatic torpedo was the Whitehead, and this is the one which has been very generally adopted by all navies.

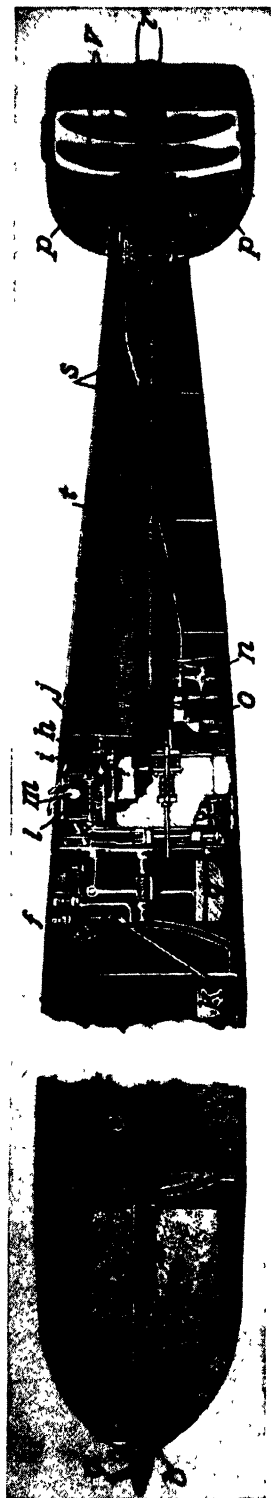
The latest types are about twenty-one inches in diameter and over twenty feet long. In appearance, the torpedo is a harmless-looking cigar-shaped tube of thin steel, with a tail, but with nothing external to suggest the wonderful mechanism and deadly explosive inside of it.

How It Is Operated. Most torpedoes are propelled by compressed-air engines; some have been equipped with electric motors, although of the latter variety, comparatively few have been made.

There are several compartments in a torpedo, and they screw into each other and form one rigid shell. At the front is the deadly section of the whole device. All after parts serve only to propel the tip of the torpedo against its distant target. The charge cone of the early models held only about fifteen pounds of explosive, but the present models sometimes contain 250 pounds. Guncotton is nearly always used, in a moist state. The fuse which ignites the explosive is connected with a tube of dry guncotton. The instant the plunger at the tip of the torpedo strikes a solid object, it explodes the charge.

Back of the charge of explosive is a compartment containing compressed air; it has a capacity varying from 10,000 to 20,000 cubic feet—enough to provide motive power to send the torpedo six miles. The next chamber contains the machinery—the large motor which operates the screws, or propellers, and a smaller motor which controls the depth rudders. This chamber is the only one which is not water-tight; it is pierced with small holes to admit water, and this keeps the engine cool. In the rear compartment is the gyroscope, without which not one torpedo in a dozen would hit its mark, for it keeps the instrument of death straight ahead on its course. Through two hollow shafts the spent air from the engine escapes into the water. Thus are caused the bubbles and consequent white track so clearly discernible in the wake of the speeding torpedo.

A torpedo may be fired from below the water line, or from a height of several feet above it. When fired from above, an air gun or cannon tube is used, charged with sufficient compressed air, powder, or cordite to blow



the torpedo into the water. After reaching the water, it sinks to the depth of six to eight feet, and proceeds toward its destination under its own power. Submarine vessels can launch a torpedo only under the water, usually blowing it out with compressed air from a shuttle tube, which closes at once after the torpedo passes from it.

The most powerful torpedo can travel about six miles, with a speed of nearly thirty miles an hour, before its power is exhausted. If it be adjusted for shorter distances, it can race through the water at the rate of about forty miles an hour, for a distance of two or three miles; this gives it a forward movement of about sixty feet every second. Submarines attempt to get closer than half a mile to their victims before firing; at a mile or a mile and a half, the chances of scoring a hit are slight; while beyond two miles, scarcely ever will a torpedo find its mark.

A Controlled Torpedo. The foregoing description re-

lates entirely to the class of torpedoes used by all navies up to the end of the World War. It had been the hope of many inventors to produce a device by which a torpedo could be sent in any desired direction, thus vastly lessening the chances of a failure in an attack. During the year 1917, it was announced that a means of control by electricity had been discovered. A wireless system, it was claimed, would send the torpedo in any desired direction, and change its course at will. The inventor was John Hays Hammond, Jr., an American who has achieved a reputation as an electrical expert. The invention was withdrawn for further improvements, but within recent years its practicability has been demonstrated. The details of this device are naturally kept secret.

Launched from Aircraft. More recently still, torpedoes have been successfully launched from aircraft. They are carried on the under side of the fuselage by straps fitted with quick-release gear. To fire a torpedo, the straps are released, the lever which starts the operative engines is pulled, and the torpedo drops to the sea with the forward speed of the airplane, instead of the speed due to being blown from a tube.

Historical. In 1585 an Italian engineer blew up an enemy's bridge at Antwerp by floating down the Scheldt a small vessel loaded with powder, which was exploded by clockwork mechanism. The next recorded experiment was nearly 150 years later, when a Frenchman exploded under water several rockets bearing heavy charges of powder, and destroyed two small vessels. An American, David Bushnell, was the first man to devise a torpedo which could be called the forerunner of the present type. It was necessary to attach it to the vessel to be blown up, and this necessitated a so-called submarine torpedo boat—not a vessel of the present submarine type, however, but a globular affair, holding one man, and intended only as a device to put the operator in close proximity to the vessel to which the torpedo was to be attached. It was a clumsy expedient, and very dangerous to the operator. Robert Fulton in 1805 also demonstrated a method of destroying ships by exploding a charge of gunpowder against the hull under water. He also called the charge a torpedo.

LENGTHWISE SECTION

- | | |
|-----------------------------------|------------------------------------|
| (a) Plunger, or striking rod | (l) Valve case |
| (b) Safety pin | (m) Air lever |
| (c) Gun cotton charge | (n) Gyroscope |
| (d) Detonating charge | (o) Gyroscope impulse |
| (e) Air chamber | (p) Rudders for horizontal control |
| (f) Charging valve | (q) Rudders for vertical control |
| (g) Pendulum | (r) Rudder controls |
| (h) Turbine | (s) Propeller shaft |
| (i) Submergence control mechanism | (t) Propellers |
| (j) Submergence valve | (u) Ballast |
| (k) Superheater | |

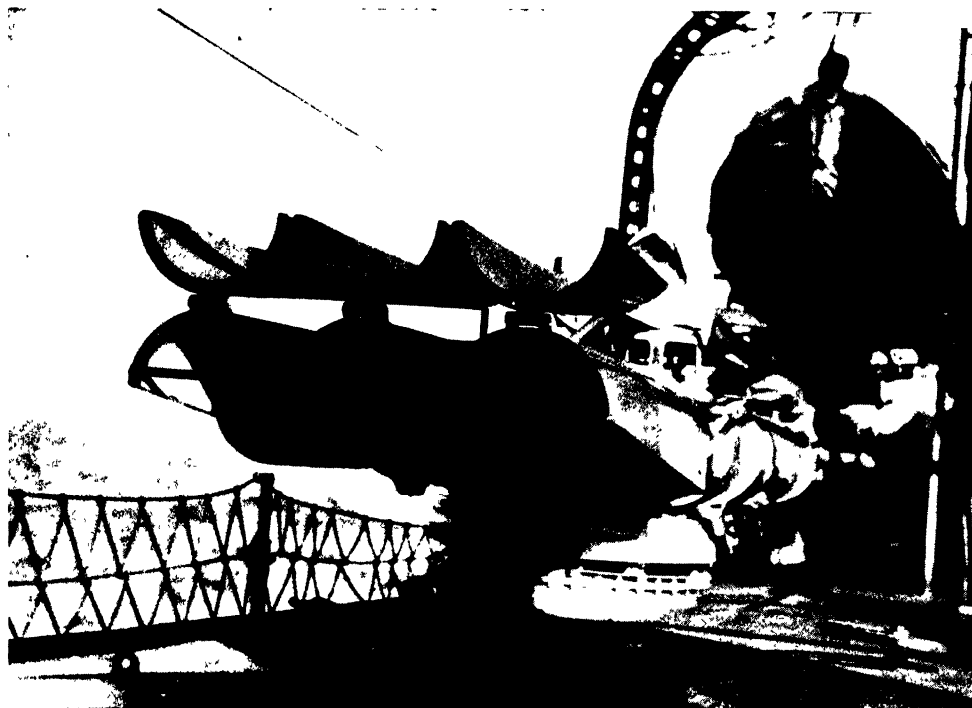


Photo: Photograms

HOW TORPEDO TUBES ARE PLACED ON THE DECK OF A SHIP

The first of the modern torpedoes intended to be projected through the water carried no engine. They were tapered wooden contrivances with an explosive head, and were shot at their target at not over one-fourth of a mile. This early weapon called for small, fleet vessels which could get close to the enemy without detection, and thus the torpedo boat of the last quarter of the nineteenth century was called into existence. The torpedo-boat destroyer was next evolved, to cope with the torpedo boat. To-day, torpedo boats are obsolete, having been supplanted by the submarine, with its effective mechanical torpedo; and every battleship, cruiser, and destroyer is equipped with tubes for torpedo warfare. See SUBMARINE, illustrations.

The present Whitehead torpedo was invented in 1864 by Robert Whitehead, a Scottish engineer who was then manager of an engineering factory in Fiume. He perfected a self-propelling, floating torpedo designed by an officer of the Austrian navy. See TORPEDO BOAT; WORLD WAR.

TORPEDO BOAT, a vessel now becoming obsolete, equipped to carry the torpedo as its principal weapon of attack. The object of such a vessel in warfare is swiftly to approach the slower enemy warship or enemy merchantman, under cover of fog, storm, or night, deliver a torpedo attack, and escape, if pos-

sible, before it can be reached by the big guns of the enemy's ships, which would sink it almost instantly. Torpedo boats are made entirely of steel, with light plates of one-sixteenth to three-eighths inch in thickness, and for defense rely principally on the speed with which they can run away from their enemies. They are fitted with one, two, and sometimes four tubes or air guns from which torpedoes may be fired, and these tubes are usually located at or near the bow of the boat. Such a vessel requires from 150 to 240 men to navigate and operate it.

The introduction of torpedo boats gave rise to torpedo-boat destroyers, which are larger, faster, and also have proved their own fitness to deliver or repel torpedo attacks; consequently, the building of torpedo boats practically ceased, although about a hundred of them were yet in commission in the navies of the world in 1930. See TORPEDO.

TORQUEMADA, *tohr kay mah' thah*, TOMAS DE (1420-1498), the first inquisitor-general of Spain. He was born at Valladolid, and became a friar preacher in the Dominican monastery in that city. For twenty-two years, he was prior of the monastery of Santa Cruz, at Segovia, and was confessor to Isabella, afterward queen of Spain. In 1478 the Inquisition was established in Spain; Torquemada, through the aid of Ferdinand and Isabella,

was made assistant to the inquisitors, and in 1483 was named inquisitor-general over all Spanish possessions.

Not only for religious reasons, but for political considerations also, he was extremely zealous, for he felt that the suppression of heretics was the only way to bring about the political unity of Spain. He was inquisitor-general for eighteen years, and during that time sentenced to death at the stake over 10,000 persons. His severity was rebuked by the Pope, and he had frequently to send embassies to Rome to defend his methods. He took part in the expulsion of the Moors from Spain, and was largely instrumental in driving the Jews from the country. The Jews, numbering 800,000 at the lowest estimate, had been the most flourishing commercial class of Spain, and the loss to the country was inestimable. Torquemada was intensely unpopular, and never dared appear in public without a strong guard. He finally retired into a Dominican monastery at Avila, where he died, leaving a name that, to this day, typifies wanton cruelty.

TORRENS SYSTEM, a system of registering titles to real estate, devised by Sir Robert Torrens, who introduced it in South Australia in 1858, when he was premier and treasurer of the colony. The system rapidly gained favor in the other colonies, and by 1874 was in use in each of the colonies of Australia, in Tasmania, and in New Zealand. It has since been introduced into Canada and other British possessions, the United States, and many of the countries of Europe. The purpose of the system is twofold:

- (1) To make the transfer of landed property as simple and safe as that of other property.
- (2) To do away with the repeated examination of titles.

The system is operated through a bureau or court of registration in charge of a registrar, with whom, in most cases, is associated an examiner of titles. In brief, it substitutes public registration for conveyancing.

Getting the First Torrens Title. The first step toward having one's land registered consists in filing with the registrar a petition for registration. With the petition, the applicant must file all records in his possession relating to the title. He must also give in writing under oath a statement of all encumbrances; that is, of debts secured by mortgage or liens, and of all delinquent taxes. These papers are referred to the examiner of titles, who proceeds to verify them. If other persons are interested in the property, by marriage or otherwise, the law requires the registrar to notify them of the petition and give them an opportunity for a hearing. In short, everything possible is done to learn all the facts bearing upon the title

under consideration. When this work is completed, the examiner of titles makes his report to the registrar.

The Certificate. If the registrar is satisfied that the title is perfect, he files away all the old papers and issues a certificate, which declares that the land is the property of the registered owner, subject only to the encumbrances described on the certificate. The certificate must be signed by the registrar. It is issued in duplicate, the official copy being filed in the office of the registrar, and the other being given to the owner. The official certificate becomes the title of ownership and is *indefeasible*; that is, it cannot be set aside or overcome. In case of transfer of the property, no further examination of the title is necessary, but it is always wise to inquire of the registrar whether any notices of encumbrances have been received and not registered. The first certificate is canceled and a new one issued, and this completes the transaction.

Insurance Fund. In case an interest in the property is found, or a just claim to it arises which was not discovered at the time the certificate was issued, the holder cannot be dispossessed of the property; but the holder of such an interest or claim may be paid from a fund created for that purpose by a small assessment on the property at the time of each registration. The rate varies in different states and countries, but it is usually one-tenth of one per cent on the valuation.

United States. The first Torrens Act in the United States was passed by the legislature of Illinois in 1895. The act was declared unconstitutional by the supreme court of the state, because it conferred judicial powers upon the registrar and examiner of titles. In 1897 another law was passed, without these objectionable features. From time to time, the system has been introduced into other states, but the progress has been slow, owing to the complicated systems in the older states, which seem difficult to replace. Since each state has its own system of registering titles, the Torrens acts vary in different states as to minor points, but they are uniform respecting their main features.

In Canada. A system of land registration based upon the Torrens system was adopted by Vancouver Island in 1861. When Vancouver became a part of British Columbia, in 1866, this system was continued over the entire province. The system is the only one used in Alberta and Saskatchewan, and is in very general use in Manitoba; it went into effect in Nova Scotia in 1907. The Ontario law adopted in 1885 is based on the English Land Act of 1875, and provides for three grades of certificates—absolute, qualified, and possessory. See **TITLE**; **DEED**.

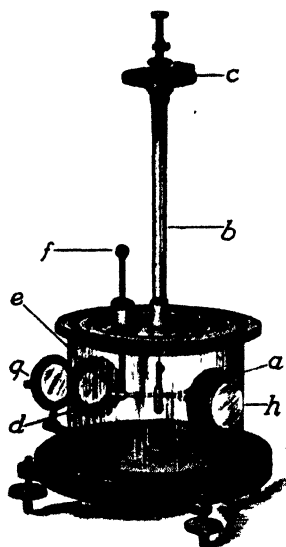
TORRICELLI, *tahr re chel' le*, EVANGELISTA (1608-1647), an Italian scientist, famous

for his discovery of the principle of the barometer. (For explanation and illustration of this law, see **BAROMETER**.) Torricelli was Galileo's assistant during the last three months of the philosopher's career, and on Galileo's death he succeeded him as professor of philosophy and mathematics in the Florentine Academy. He improved the microscope and telescope, and made several important discoveries in mathematics and physics. See **GALILEO**; **AIR**.

TORRID ZONE. See **TROPICS**; **ZONE**.

TORRINGTON, CONN. See **CONNECTICUT** (back of map).

TORSION, *tawr' shun*, **BALANCE**, an instrument for measuring very small forces. It consists of a horizontal bar, suspended by a thread of silk or other substance, so that it will balance. Threads of quartz are very generally used for the purpose. In the illustration, *a* is the bar, *b* the thread. The upper end of the thread is attached to a graduated head, *c*, by whose rotation the intensity of the force is measured. The operation of this balance may be illustrated in the measurement of an electric charge. The two balls, *d* at the end of the bar, and *e* at the end of the rod *f*, are in the position shown in the illustration, and the pointer on the graduated disc is at 0°. The balls are then charged, and the electricity forces them apart. By looking through the telescope, *h*, one may see their divergence in the mirror, *g*. The graduated head is then turned until the torsion (twisting) of the thread is sufficient to bring the balls to their former position. By previous testing, the force exerted upon the thread by a complete rotation of the graduated head is known, so that the force exerted by any number of degrees may be readily determined. See **GALVANOMETER**.



TORSION BALANCE

Explanation of the figure appears in the text.

A.L.F.

TORSIONAL STRESS. See **STRENGTH OF MATERIALS**.

TORT, *tawrt*, has been defined by various authorities as a private or civil wrong or injury, independent of contract; a breach of a

legal duty; and a violation of anyone's right to personal security, to liberty, to property, or to reputation. The shortest and commonest definition is "a civil wrong." A tort differs from a crime in that the latter is an offense against the state, and not the individual.

Torts is the term used to designate the branch of law which treats of the redress of injuries not classified as crimes or as breaches of contract. In this branch are included slander, libel, trespass, alienation of affection, nuisance, and negligence.

The chief distinction between a tort and a breach of contract is that the former involves a greater degree of moral guilt, though there are cases in which action could be brought on either ground. For example, a person who buys a ticket of a railroad virtually enters into a contract with the road, whereby he is guaranteed a certain amount of safety. If one of its employees attacks him, the injured passenger can sue for damages on the ground of assault (an action in tort), and also for breach of contract for transportation.

Derivation. The word *tort* is derived from the Latin *torquere*, meaning to *twist*, or *wrest aside*.

Related Subjects. In connection with this subject, the reader may consult the following articles in these volumes:

Assault and Battery	Negligence
Contract	Nuisance
Crime	Slander
Libel	Trespass

TORTICOLLIS, *tawr tih kahl' is*. See **RHEUMATISM**.

TORTILLA, *tohr teel' yah*. See **MEXICO** (Living Conditions); **BREAD**.

TORTOISE, *tawr' tus*. See **TURTLE** (Tortoises of the Land).

TORTOISE SHELL. See **TURTLE**, subhead.

TORTURE, *tawr' ture*, the infliction of severe physical pain by the use of the rack, scourge, stake, or other instruments and devices, as a punishment for crime, for the purpose of revenge, or to compel confession or the giving of evidence in judicial proceedings. The American Indians and other primitive peoples were accustomed to inflict torture on captured enemies, but civilized nations as well, in the past, have not scrupled to make use of this practice, both in religious and in civil procedure. In Greece, slaves were examined under torture; under the Roman Empire, it was also inflicted upon freemen. In Europe, in the Middle Ages, torture was commonly resorted to by Church and State to procure confessions of guilt and to punish offenders, and among its victims were such men as Savonarola and John Huss.

By the sixteenth century, public sentiment had been generally aroused against the practice, but it lingered in various sections of Europe until the early part of the nineteenth century; and even as late as the Russian

revolution of 1917, flogging with the knout was the lot of Siberian exiles. Its use in Catholic countries was prohibited in 1816 by a Papal bull. The various devices and methods that have been employed by torturers are numerous and complicated, and it would seem that human ingenuity could have gone no further in devising ways of inflicting bodily misery. For a peculiar method of deciding the guilt or innocence of an accused by torture, see ORDEAL AND COMBAT, TRIAL BY.

TORY, from the end of the seventeenth century until about 1832, the name of one of the two great political parties in Great Britain. The word is said to be derived from the Irish *Tar a Ri*, "Come, O King!" a call familiar to the Irish loyalists who fought for King Charles I. Under the Commonwealth, almost any kind of a bandit or outlaw was a Tory, and after the Revolution of 1688, the term was freely applied to the Irishmen who waged a guerrilla warfare on behalf of King James II. "Tory" was about the most offensive epithet in the vocabulary of an English Protestant.

Meanwhile, the word was used in a political sense, one which is more familiar. After the Restoration, there was a "country party" and a "court party," but in 1679, when Charles II was in the midst of his quarrels with Parliament, these parties called each other the worst names they could think of—Whigs and Tories. To call a man a Tory was to class him with the Irish outlaws, and the term was used in derision of the members of the court party, who refused to support the bill for the exclusion of the Duke of York, later James II, from succession to the throne because he was a Catholic. In time, the origin of these words was ignored, and they became the official party titles.

During the eighteenth century, the Tory party included most of the small landowners and the clergy, while the Whigs were the landed aristocracy and the merchants and small tradespeople. Under George III, the Tories managed to curb the power of the great Whig landowners, who had controlled Parliament through "rotten" or "pocket" boroughs. They now naturally relied on the power of the Crown and, through the influence of the younger Pitt, added the principle of reliance on the people. The French Revolution upset this arrangement. The new democracy, which quickly spread to England, was opposed by the landed interests as well as the king, and the ranks of the Tories soon included most of the former Whig landlords. The Whigs now became the party of progress (see WHIG), while the Tories, in spite of Pitt's efforts, became identified in the minds of the people with the general principle that the existing state of affairs was satisfactory. After the Whigs secured the passage of the Reform Bill of 1832, the Tories ceased to be a power and the use of the name gradually de-

clined, but their place is practically filled by the Conservative party of the present time, who are still sometimes called Tories by their opponents.

In the American colonies, before and during the Revolution, any person who was known to have, or was suspected of having, loyalist sympathies was called a Tory by the colonists who favored independence. See CONSERVATIVE; WHIG.

TOSCA, *LA*, *tahs' kah, lah*. See OPERA (Some of the Famous Operas).

TOSCANELLI, *tahs kah nel' le*, a geographer of the Middle Ages. See GEOGRAPHY (The Age of Discovery).

TOSKS. See ALBANIA (The People).

TOSTIG. See HAROLD (III, Norway).

TOTEM, *toh' tem*, among primitive peoples, an object regarded as the symbol of a tribe, clan, family, or individual. The totem may be a bird, fish, beast, or any other object, though usually an animal is selected. Sometimes the totem is looked upon as the tribal object of worship, as in the case of an Australian tribe which reveres the emu as the sacred totem of the group.

The practice of carving totem figures on poles is common to many North American Indian tribes, especially those of the Pacific coast from Vancouver to Alaska. These Indians often made totem poles by carving the trunks of cedar trees. Such poles served as a means of expression for family pride, as well as for a link binding together members of the same totem group or clan. Persons holding a certain animal crest were guaranteed hospitality at the hands of all members of the totem kinship, but intermarriage within the clan was forbidden.

Stories of local happenings and records of Indian wars were emblematically depicted on some of the larger poles, and elaborate ceremonies accompanied their raising. Excesses in connection with these celebrations sometimes involved human sacrifices, and finally led to governmental opposition to the rites. An exceptionally fine specimen of a totem pole, donated to Lincoln Park, Chicago, was erected there in 1929.

TOUCAN, *too kahn'*, a bird of tropical and semitropical America, which has an enormous beak, a thick, short body, and short legs. The upper mandible is curved over the lower and is notched at the edges. In a tropical species of Brazil and Guiana, the beak is eight inches long and three inches high at the base. The tongue, also, is curiously flattened and notched, and the bird's tail is joined to its body by a ball-and-socket joint, which permits of its being raised above its back with a jerk, as if operated by a stiff spring. Toucans are brilliantly colored; their black or green bodies are marked with red, orange, white, or blue,



Photo: U & U

Totem Poles. A famous totem at Wrangell, Alaska. The house belongs to an Indian family; the circular window is supposed to represent the sun, and is expected to bring good fortune. The totem in the inset is in a public park in Victoria, B. C.



Photos: Wide World; Visual Education Service

THE TOUCAN

At left, head and bill of one of these birds in the London (England) zoo; photographed in the act of eating a delicate morsel. At right, a horned species of Guiana.

and the beaks are crossed with vivid bands. They feed on fruit, small birds, lizards, and other animals, and are often destructive to orange plantations. Their eggs, pure white in color, are deposited in holes in trees. In the Andes, they are found at an altitude of 10,000 feet. D.L.

Classification. Toucans belong to the family *Rhamphastidae*. The typical species are placed in the genus *Rhamphastos*.

TOUCH, one of the five special, or exterior, senses, the one which gives to the individual his most intimate knowledge of objects in the world about him. He may judge the color and general shape of an object by looking at it, but he can learn just how rough, or how sharp, or how soft it is, only by feeling it. This tactile sense is perceived through the stimulation of sensory nerves which have their end-organs in the skin and the mucous membranes.

It is believed by modern physiologists that the tactile sense cannot be perceived alone, but that the same nerves which transmit this sensation also give us our sensations of warmth, cold, and pain. As is known from common experience, slight pressure can be increased until the original sense of touch becomes definitely a sensation of pain.

The delicacy of the sense varies in different parts of the body. This is due to the fact that the end-organs for the perception of this sense are not distributed evenly over the body, but are scattered rather unevenly in clusters. Where there are the greatest number of end-organs, the sense of pressure will be most accurate. It is most highly developed on the tip of the tongue, and least developed on the back of the shoulders. The tips of the fingers and end of the nose are other sensitive

areas. In such regions, the end-organs are very numerous. Scientists measure the acuteness of this sense by using an instrument having two needle points operated like the points of a compass. In a section of great sensitiveness, these two points can be separately felt when but a fraction of an inch apart. The distance at the tip of the tongue is 1.1 millimeters (about $\frac{1}{28}$ inch), as compared with 66 millimeters (about 2.6 inches) on the back of the shoulders.

The end-organs for the perception of warmth, cold, and pain have the same uneven distribution over the skin that is described for those of touch. One may discover this for himself by running some pointed metal instrument over his skin. The instrument will be colder than the skin, but it will be noticed that at some points it will feel cold, and at others it will simply be felt as pressure.

Authorities have located 30,000 spots on the skin of the trunk and limbs, from which the sense of warmth is conveyed to the brain, and over 200,000 "cold spots" have been identified. The importance of developing the tactile sense is recognized by modern educators, and touch exercises have a place in all kindergarten and Montessori schools. In the acquisition of knowledge, touch is as important as sight. It was through the training of this sense that Helen Keller, blind and deaf from infancy, learned to read, write, and speak, and join in world activities. K.A.E.

[See SENSES, SPECIAL, and the list of related subjects there given.]

TOULON, *too lawN'*. See FRANCE (Interesting Cities).

TOULOUSE, *too looz'*. See FRANCE (Interesting Cities).



A TOURNAMENT OF MEDIEVAL DAYS

TOUR, COGNIARD DE LA (1777-1859). See YEAST.

TOURMALINE, *toor' ma lin*, a common and beautiful mineral, which crystallizes in the hexagonal system and is found chiefly in granite, gneiss, and mica schist. The mineral is harder than quartz and will easily scratch glass, but its exact constitution has not been determined by scientists. There are three types of tourmaline, differentiated according to the oxides present—the black, or iron, tourmalines; the brown, or magnesia; and the alkali tourmalines of rich reds, greens, and blues. The latter sometimes occur as beautiful, transparent gems. Pink and red tourmaline gems are known as *rubellite*, or *Siberian ruby*; the colorless, as *achroite*; and the blue and green stones as *indicolite*, or *Brazilian sapphire*. Often, in the same crystal, there will be two or more contrasting colors, either sharply distinct or blended, and frequently the color differs as the light strikes the prism lengthwise or crosswise. The optical properties of tourmaline are, in fact, of exceptional interest, a ray of light entering a crystal being split up into two rays.

Bright-colored tourmalines occur in San Diego and Riverside counties, Calif.; the mines in these regions were exploited to meet the expected demands of the Panama-Pacific and San Diego expositions, in 1915. Blue and green stones are found in gem pockets in the quarries of feldspar and other rocks in Con-

necticut, Maine, Massachusetts, and New Jersey; and black and brown crystals are found in New York quarries. The Ural Mountains, the island of Elba, Brazil, Maine (in the vicinity of Paris), Siberia, and Ceylon are famous for bright-colored tourmalines, and much of the achroite also comes from Elba. Blue varieties are found in Sweden, and the black stones occur in Norway, England, Greenland, and the Tyrol. Gem tourmalines are also found in Madagascar.

The interesting physical properties of this mineral have made it useful as well as ornamental. By heating and friction, it is rendered highly electric, and it is valuable as a conductor. Transparent tourmaline is also one of the few substances which obstruct some of the vibrations of light, a condition that produces polarization of light. For a full explanation of this phenomenon, see POLARISCOPE and POLARIZATION OF LIGHT. With the opal, tourmaline is a birthstone for October (see BIRTH-STONES). See, also, CRYSTALLIZATION.

TOURNAMENT, or **TOURNEY**, the name given in medieval times to the mimic battles of mounted knights, who displayed their military prowess by tilting at each other with blunted lances or by fighting with swords. A tournament was usually arranged by some prince or noble, who sent a herald to foreign courts, or through his own dominions, announcing the "clashing of swords in presence

of ladies and damsels." The combats took place on horseback, and each knight generally carried some emblem of his lady's favor. Minute regulations were enforced, which lessened the danger of the tourney, although there were sometimes combats *à l'outrance*, or "to the death." In every tournament there were a great many single encounters, as well as combats between parties of knights.

The tournament is said to have originated in the tenth century. However, these contests were probably most popular during the eleventh, twelfth, and fifteenth centuries. The first combats were held in France, but the custom spread to England, Germany, and the south of Europe. It was during the fifteenth century that characteristics of the pageant began to enter into the tournaments, and this explains, perhaps, why the modern carnival or pageant is often called, in error, a tournament.

The Modern Tournament. This is an affair held by soldiers or athletes to exhibit their training in the use of arms and accouterments, and their skill in military maneuvers, games, and sports. Series of games lasting several days are also called tournaments, as tennis and golf tournaments.

In Literature. A thrilling description of a medieval tournament is to be found in Sir Walter Scott's famous historical novel *Ivanhoe*; and in Disraeli's novel *Endymion* there is an interesting account of the tournament at Eglinton Castle, Ayrshire, in 1830, which was an attempt to revive the splendors of the tourney in comparatively modern times.

TOURNIQUET, *toor' nih ket*, an instrument or device used to check bleeding in an accidental wound, or to stop the flow of blood



A TOURNIQUET

during an amputation. A simple tourniquet, for use in case of emergency, can be made from a cord, handkerchief, or other piece of

cloth. If the wound is a cut artery—and in that case bright-red blood will spurt out in jets—tie the cloth around the limb at a point between the wound and the heart, slip a short stick into the loop, and twist the stick until the bleeding is checked. A stone laid under the bandage will aid in increasing the pressure at this point. It is best not to permit the tourniquet to remain tight for more than half an hour at a time, for it is liable to cause necrosis or gangrene of the limb. If nothing is at hand to make a tourniquet, compress the bleeding vessel with a padded key, or even the finger. If the hemorrhage is from a cut vein, causing an even flow of dark-red blood, apply the tourniquet on the side away from the heart.

Surgeons' tourniquets are of various forms. One of these is a semicircular piece of metal used in compressing the aorta in the abdomen; another is a piece of flat rubber tubing, which is wound around the limb several times; still another consists of a padded strap to compress the artery, a band which is fastened around the limb, and a bridgelike device over which the band passes. This bridge is raised by a screw, when it is desired to tighten the band. See BLEEDING; FIRST AID TO THE INJURED. W.A.E.

TOURS, *toor*. See FRANCE (Interesting Cities).

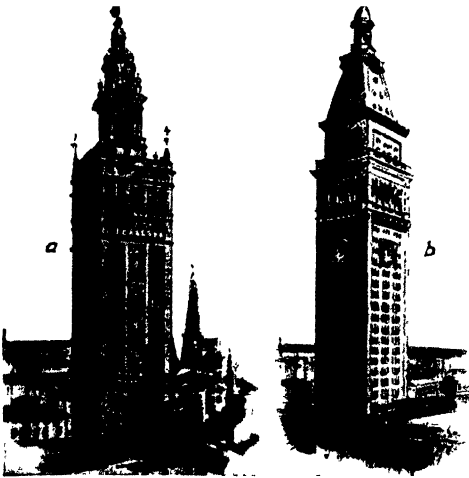
TOURS, BATTLE OF. See FIFTEEN DECISIVE BATTLES.

TOUSSAINT, *too saN'*, FRANÇOIS DOMINIQUE (1743-1803), a statesman, revolutionist, and patriot, the greatest hero in the annals of Haiti, known as TOUSSAINT L'OUVERTURE. He was a full-blooded negro, born in Haiti of slave parents. When affairs became troubled after the outbreak of the French Revolution, Toussaint became a leader in a slave rising (1791); but when the National Convention in France proclaimed freedom to all the slaves, two years later, he came with his forces to the assistance of the French against the Spaniards. By 1796 he had won such confidence that he was made commander in chief of the French troops on the island, and drove out the British, who by that time were beginning to attempt conquest.

Three years later, a sharp struggle took place between the negro and the mulatto population, and at its close, Toussaint, leader of the former, found himself the real ruler of the island. He exercised a wise and beneficent sway, and the island had a period of almost unprecedented prosperity. This was interrupted, however, by Napoleon Bonaparte, dictator of France, who proclaimed the reestablishment of slavery in Haiti; when Toussaint resisted, Napoleon sent an army to compel submission. By false promises, Toussaint was induced to submit, and was then treacherously seized and carried to France, where he died in captivity. See HAITI.

In Literature. He was a true patriot and an upright man, and to his noble qualities Wendell Phillips did full justice in one of his most famous speeches, *Toussaint L'Ouverture*. Several biographies of him have been published, with many appreciative articles on his life and work. His popular name was derived from a remark by the French governor of Haiti, that "this man finds an opening everywhere," *ouverture* being the French for *opening*.

TOWER. Towers have been built from early times as places of defense, as observation points, as ornamental structures, and for other purposes. They have served as prisons, as places of refuge, as campaniles, and as lighthouses;



MEDIEVAL AND MODERN TOWERS

(a) Bell tower of the cathedral at Seville, Spain.
(b) tower of the Metropolitan Life Insurance Building, New York City, reaching forty-six stories above the sidewalk

and they have been built as single edifices and as parts of churches, mosques, fortifications, and castles. In addition to the accompanying illustration, the use of the tower in modern buildings is shown in the article **ARCHITECTURE**, in illustrations of the Woolworth Building, New York City, and the University of Pittsburgh; and in the article **CHICAGO**, in which are pictured the beautiful Gothic tower of the *Chicago Tribune*, and others. Some of the beautiful towers of great cathedrals are pictured in the article **CATHEDRAL**. Among other famous towers are the *White Tower* of the Tower of London; the *Eiffel Tower* in Paris; the *Leaning Tower of Pisa*; and the *Campaniles* at Florence and Venice.

Related Subjects. For descriptions and illustrations of various towers, see the following articles:

Architecture
Campanile
Eiffel Tower
Lighthouse
Minaret

Pisa, Leaning Tower of
Round Towers
Singing Tower
Tower of London
Towers of Silence

TOWER OF LONDON, a group of buildings comprising an old feudal fortress and former prison, now used chiefly by the British War Department as barracks and an armory. It is in the East End of London, on the north bank of the Thames, and just outside the limits of the old walled city. The shallow moat includes a space of thirteen acres, which is surrounded also by a high wall, and within are the grim buildings, with their enormously thick walls, the whole forming a stronghold which could well have resisted an army. Thirteen towers rise at intervals from the inner wall; each has a more or less interesting history.

The oldest of the structures is the central White Tower, built in the time of William the Conqueror (1078) on the site of an earlier fortress, dating, according to some authorities, from the rule of Julius Caesar. The White Tower was designed by Gundulf, bishop of Rochester. Some of the early kings of England resided and held court in the Tower, each adding something to the fortifications; but it is chiefly for its history as a prison that the great group is interesting. Many distinguished prisoners were led forth from one or another of its buildings to execution, and a large number of these, including Sir Thomas More, Anne Boleyn, Lady Jane Grey, and Catharine Howard, lie buried in the Tower Chapel. Sir Roger Casement, the leader of the Irish rebellion of 1916, was confined in this historic prison until his execution. A great collection of armor, founded by Henry VIII, is in the White Tower.

To-day, besides arms sufficient to fit out a large army, the Tower of London contains the royal jewel office, with its treasures of gold and precious stones, including the crowns, scepters, and other royal regalia. Visitors are admitted, and find much to thrill them, though the associations of the place are almost uniformly tragic. The attendant staff, called *Yeomen of the Guard*, who still wear their picturesque Tudor costume, are familiarly known as "Beefeaters." See color plate, in the article **LONDON**, and page 7228.

TOWER OF THE WINDS. See **ATHENS** (*The Ancient City*).

TOWERS OF SILENCE. Among the Parsees of India, who are followers of the ancient fire-worshipping cult of Zoroaster, and do not believe in burial, it was long the custom to expose the bodies of their dead on so-called Towers of Silence, or *dakhmas*, to be devoured by vultures. In pursuing this practice, they have adhered strictly to the precepts of their ancient creed, as set forth in the *Zend-Avesta* (which see); but the British administrative officials in India have long frowned upon this Parsee method of disposing of the dead, and it is falling into disuse.

The construction of the Towers of Silence facilitates the disposal of the bones left by the



Photo: G R O C

THE TOWER OF LONDON

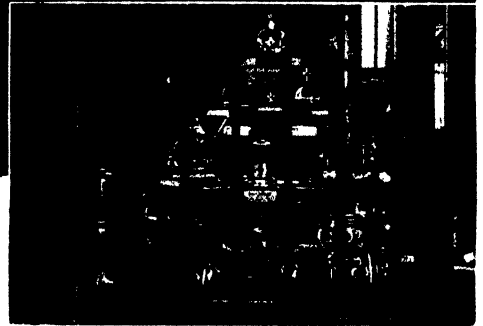
A center of interest for the entire British Commonwealth of nations. The inset shows the British crown jewels, which are in the Tower. (See page 7227)

vultures. They are squat towers, circular or rectangular, seldom exceeding thirty feet in height, and are built over a deep pit, with an exposed grating at or near the top, on which the

**ONE OF THE TOWERS OF SILENCE**

[See, also, the article BURIAL, for a more elaborately constructed tower.]

bodies are laid. After the vultures finish their work, the bones drop into the pit below.



The Parsees of India, descendants of ancient Persians who emigrated in the eighth century, when their country was conquered by the Arabs, now number about 100,000. Many of them are wealthy, and, despite their funerary customs, they are generally well educated and commercially enterprising. They set apart each year one day for a festival in honor of a deity who is supposed to preside over the departed souls of men. On that day, the people congregate on the hills where the Towers of Silence are situated, and pray for the departed souls, while ceremonies for the dead are performed by the white-robed and white-turbaned priests of the Zoroastrian cult. See ZOROASTER; PARSEES.

TOWN MEETING, an annual assembly of the voters in the New England township. It originated in, and is a survival of, colonial days. In its practical operation, the township system is the purest form of democratic government known, because it is government by the people themselves, not government by their elected representatives. Once a year there is held a town meeting which is attended by the voters who are twenty-one years of age

and over. At these meetings, selectmen, trustees, school officials, and other officers are elected, town laws are enacted, taxes are voted for the coming year, and local improvements and other business matters are discussed and decided. A record of all business transacted is made by the town clerk. The township system is a typical New England institution, but it has been adopted, sometimes with modifications, elsewhere.

TOWNSHEND ACT. See REVOLUTIONARY WAR (Causes).

TOWNSHIP. See UNITED STATES (Government: Types of Local Government); LANDS, PUBLIC; MUNICIPAL GOVERNMENT.

TOWTON FIELD, BATTLE OF. See EDWARD (IV, England).

TOXEMIA, *tok se' mih ah*. See BLOOD (Blood Poisoning); TOXINS.

TOXICOLOGY. See PHARMACOLOGY.

TOXINS, *tok' sinz*, poisonous substances formed by the growth of bacteria. Some toxins remain within the bacteria, and others are secreted by them. Many bacterial diseases are the result of poisoning by toxins, such as diphtheria and lockjaw. Both diseases are *toxemias*. Some antitoxins are made by injecting toxin into large animals. W.A.E.

Related Subjects. The reader is referred in these volumes to the following articles:

Antiseptic	Disease (Germ Theory of Disease)
Antitoxin	Life Extension
Bacteria and Bacteriology	Medicine and Drugs

TOYNBEE HALL. See SOCIAL SETTLEMENT.

TOYS. The desire to imitate the action of his elders is born in every child. The tiny girl must "mother" something, must play the housewife or the teacher; the little boy must be an engineer or a fireman, a farmer or a policeman, a motorist or an aviator; and it is of this universal desire that the necessity for toys is born. Toys are artificial helps in this universal mimicry, and if they are not furnished, substitutes for them, however crude, will be devised by the children. If the little girl has no cups and saucers for her afternoon tea party, acorns and leaves can be made to take their places; if the small brother has no hobbyhorse, a chair and a rope furnish an acceptable substitute; and a little red wagon easily becomes an automobile.

The Right Kind of Toys. The judgment of those who have made a study of children and their play favors decidedly the acorn cups and the chair horse, rather than too elaborate substitutes. Occasionally, a child is found who seems to be completely lacking in the happy faculty of "make-believe." He can see only what is there, can hear only actual sounds. He cannot in imagination clothe the broken kitchen chair with glossy hair and waving mane, or hear the fierce growls of the dragon that lurks

in the dark under the table. Such a child demands elaborate toys that leave no details to be supplied.

But the ordinary child is not thus handicapped. Give him a hint, and the rest follows as if by magic. The sofa can be a ship or a cave in the desert, a soldier's cot or a king's throne, all in the course of an hour; the roughly hewn wooden figure can be a robber chief or an Indian, a hero or a villain, and can actually look, to the child's eyes, like every one of these in turn. To give to such a child toys too elaborately wrought is to do him a real injury. *Creative imagination should be fostered, not stifled, in every child.*

The best kinds of toys, then, are those that suggest, rather than fulfill, and those with which the child can really do something. Mechanical toys, which supply their own energy, should never be allowed to take the place of those into which the child must infuse a part of his own life and energy. For boys, however, toys which allow an expression of the constructive instinct are most desirable.

The Home-Made Toy. It follows from this that the toys which are made by the children themselves are the ideal ones. Expensive materials and tools are neither necessary nor desirable; an array of boxes of various sizes, spools, paper, string, and cigar-box wood, together with a hammer, scissors, and small nails, and a bottle of glue, will keep the ingenious child happy indefinitely. The doll's house may be furnished throughout with furniture made of pasteboard or heavy paper (see KINDERGARTEN), and the doll inmates, with all their changes of costume, can be fashioned easily, according to suggestions made in the article DOLL (Paper Dolls). Clothespin men afford much amusement, and spools and match boxes provide material for all sorts of carts and wagons. The child who is "handy" and has a fair degree of ingenuity can manage to make use of many of the odds and ends which are thrown into the wastebasket.

The making of such toys furnishes an excellent introduction to the manual-training work of the schools; and any boy who has taken manual training should find no difficulty in making, for the delight of his younger brothers and sisters, many simple wooden toys.

History of Toys. Just because toys are imitative and reflect the fashions and the interests of the day in which they are made, they are of real interest to students. The jointed wooden dolls and the crocodile with movable jaws, found in the tombs of ancient Egypt, make that far-away time and country seem much closer and more human, while the tops and hoops with which the Roman children played prove that child nature and child desires have changed little through the centuries. Doubtless the Roman boys played at chariot-racing

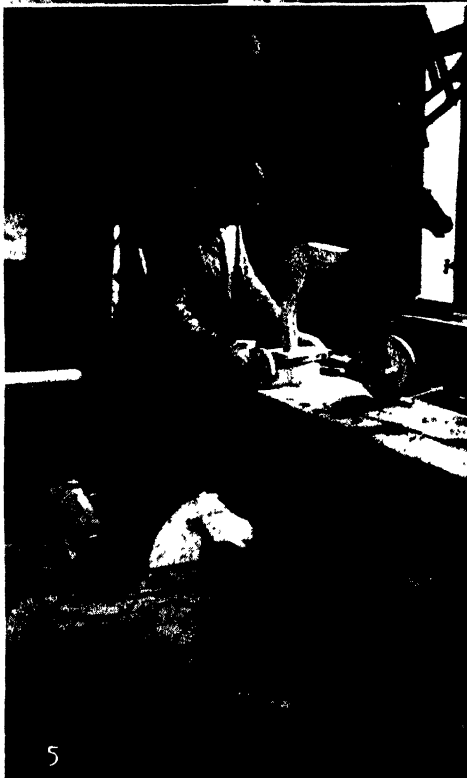


TOY MAKING

with improvised chariots, and the boys of the Middle Ages probably fashioned for themselves standards ornamented with the Cross of the Crusaders.

There is one curious thing about those toys which have been preserved from the Middle Ages, and that is the infinite care and fine workmanship which are everywhere visible. There were no special toy-makers in those days, and the goldsmith who made the elaborate ornaments for the cathedral not infrequently condescended to carve miniature soldiers or horses for the children of his wealthy patrons.

Every advance in science left its mark on the toy-making of the day. When the balloon ascensions of the Mont-



IN GERMANY

golfer brothers were holding the attention of the world (see BALLOON), children everywhere were amusing themselves with toy balloons, and were climbing to high places in order to launch toy parachutes. When automobiles became practicable and common, the toy machine followed close upon the real one; and in these later days, there is scarcely a boy with any hint of ingenuity who has not busied himself with make-believe flying machines.

The making of toys has become a vast industry in recent years. For a long time, however, the manufacture of these child necessities was practically confined to Europe, the French making the costly and

beautiful toys, the Germans the simpler and less artistic ones. Nuremberg long has been the center of toy-making in Germany. In that country, for many years, toys have been made in the homes. Indeed, certain villages have been noted for just one kind of toy, dolls being made in one place, and animals in another. Until the last years of the nineteenth century, there was not a doll factory in the United States. The change had begun before the outbreak of the World War; for several years, toys of American children were being made in America in steadily increasing numbers. During the war, importations of foreign toys almost ceased, and it became evident that the hundreds of American factories could turn out toys which were more attractive than the imported ones, and which were almost as cheap. Winchendon, Mass., is the greatest toy center in the United States, nearly every enterprise in the town being a toy factory.

Since the war, the United States has placed an almost prohibitive duty upon the importation of foreign toys, in order to stimulate domestic production. It is now estimated that the toy business of the United States averages \$100,000,000 annually. M.V.O'S.

Related Subjects. The reader may refer to the following articles in these volumes.

Child	Kindergarten
Doll	Play
Games and Plays	

TRACER BULLETS. See **AMMUNITION** (Modern Bullets).

TRACERY, the intersecting rib work, bands, and fillets in the upper part of Gothic windows, used for support and for ornamentation. The



FAN TRACERY

Example from the vault of Henry VII's chapel, Westminster Abbey.

term is also applied to the interlaced work of a vault, walls, or panels in Gothic churches and cathedrals, and may be extended to similar forms used in relief, as wall decoration (sometimes called *wall tracery*); hence, figuratively,

it may refer to any intricate line pattern. The art of tracery was first practiced in Gothic architecture in France and England in the thirteenth century. It was then used in window ornamentation, but has gradually extended to almost every part of church buildings.

The chief forms of tracery include the *geometric*, with bars or ribs all about the same distance from one another; the *flowing*, with free, curving lines; and the *flamboyant*, with flowing and swaying lines. The latter is an elaboration of the flowing style.

Church architects in recent years, working in a modernized Gothic style, have found in tracery a valuable means of expression. The Liverpool Cathedral, which is still uncompleted, and the new Church of the Heavenly Rest, New York, furnish examples of this modern tracery, as Lincoln Cathedral, England, dating from the thirteenth century, does of the old.

Fan Tracery. This is a form of ornamentation used on the surface of vaults (see **VAULT**). It is an elaborate, carved tracery which spreads out like the folds of a fan.

TRACHEA, *tra' ke ah*, the scientific name for the principal air tube in the human body, which is commonly spoken of as the *windpipe*. The trachea starts at the pharynx, and can be felt in the front part of the neck as a section of hard ridges. It ends with the bronchial tubes, and through these structures communicates with the lungs (see illustration under **LUNGS**). The larynx, or voice box, is a modified part of the trachea. In an adult, the windpipe is about three-fourths of an inch in diameter. It consists of a supporting layer of connective and muscular tissue, lined with mucous membrane, and its walls are kept from collapsing by incomplete rings of hard cartilage, which enclose the tube at the front and on the sides. The back of the tube rests against the oesophagus. On the surface of the mucous membrane there is a layer of cells, each of which terminates in a tuft of tiny threads. These delicate hairs, or *cilia*, are constantly moving back and forth, and their purpose is to force dust particles and bits of mucus away from the lungs. K.A.E.

Related Subjects. In connection with this subject, the reader should consult the following articles:

Breath and Breathing	Lungs
Larynx	Nose

TRACHODON, *tra' ko dahn*. See illustration in article **DINOSAURIA**.

TRACHOMA, *trah ko' mah*. See **BLINDNESS** (Common Eye Diseases).

TRACHYTE, *trak' ite* or *tra' kite*, is a volcanic rock consisting chiefly of glassy feldspar and a small amount of biotite, hornblende, or augite. The name is derived from a Greek word meaning *rough*, and was applied because the small, lathlike crystals make the broken



THE TRACTOR IS A MODERN FARM NECESSITY

Photos: International Harvester Co.

surfaces of specimens rough to the touch. In color, trachyte ranges from pale gray through pink to black. Trachyte is found in the United States in Wyoming, Colorado, Montana, South Dakota, Utah, Washington, and Nevada. It occurs in great abundance along the River Rhine and in Italy, France, and the Azores. A.J.

TRACTARIANS. See OXFORD MOVEMENT.

TRACTION ENGINE, OR TRACTOR. Tractors equipped with internal-combustion engines of a small or medium size, adapted to the farms throughout the eastern part of the United States, were first developed about 1914. Prior to that time, most of the tractors with internal-combustion engines were very large and crude affairs, and also undependable and expensive to operate. Since 1915, the smaller sizes, weighing from 3,500 to 7,000 pounds, have been developed to a rather high state of perfection. As an example, the old-type, large, heavy tractors were not usually able to develop a pull greater than approximately one-third of their total weight, whereas practically all modern tractors can exert a pull equal at least to two-thirds of their weight, and many can do better than this.

In the development of the modern tractor, many different shapes and wheel arrangements have been tried out. Some have two wheels, some three, and others four, and some have endless tracks or belts, upon which they run. At the present time, the majority of farm tractors are of the four-wheel type, with the arrangement of wheels and the application of power similar to those of an automobile. There is one other type that is used to some extent for farm work, known as the track-layer type, or *caterpillar*, which became familiarly known during the World War, through its military development into "tanks."

Most modern tractors are unique in design, in that the gear housing is also the frame of the tractor. This arrangement simplifies the construction considerably, and insures a rugged, substantial construction that maintains correct alignment of the working parts, over a long period of time.

The modern tractor, in addition to being comparatively light in proportion to the power which it can develop, is sturdy, dependable, comparatively long-lived, and efficient in the use of fuel and oil. It is also easy to handle. It is a comparatively easy job to handle a tractor that will pull three fourteen-inch-bottom moldboard plows; whereas six to eight big horses would be required to pull the same plow. These would be more difficult to handle in the field, and would require a great deal more time and attention in feeding and care, and in hitching up and unhitching.

The tractor apparently has taken its place as an important power unit upon American farms, and continues to be used in greater

numbers. The principal advantages of the tractor are, first, that it enables one man readily to do more work; second, it is usually possible to harvest the crops with a greater economy of time, thus producing better crops; and third, if the machine is properly managed, the cost of doing work with a tractor is usually less than the cost of doing the work with horses. The comparative costs of tractor and horse power vary with the cost of fuel and feed, and also, to some extent, with other factors. F.W.D.

[American tractors of both the wheeled and the caterpillar type are now exported to all parts of the world, exports being more than twenty-seven per cent of the total yearly production. There are more than thirty American concerns manufacturing wheeled agricultural tractors, and five producing the caterpillar type, which originated at Peoria, Ill. For illustration of the army tank, see WORLD WAR.]

TRACTOR. See TRACTION ENGINE.

TRACY, MARQUIS DE. See CANADA (History).

TRADE. See COMMERCE.

TRADE, BOARD OF. See BOARD OF TRADE.

TRADE ACCEPTANCE. The Federal Reserve Board defines a trade acceptance as "a bill of exchange (time draft) drawn by the seller on the purchaser of goods sold, and accepted by such purchaser." It differs from the ordinary time draft in being made at the time of the sale, instead of at the expiration of the term of credit for the purpose of giving additional time.

The trade acceptance is a preferred class of collateral security, and may be discounted at a bank for approximately face value. This is a great advantage to manufacturers and merchants with limited capital, as it obviates the necessity of tying up their capital in open book accounts, or of resorting to heavy borrowing. The discounting of trade acceptances does not affect the borrowing capacity of a firm in regard to its own or others' notes.

The closing of a credit sale by a trade acceptance promotes promptness in paying accounts; for the acceptance may be collected through a bank if it has not been discounted. Furthermore, as a rule, an obligation maturing at a bank will be paid more promptly than an open account.

The trade acceptance has been used quite generally in Great Britain and continental Europe. In recent years, there has been a movement in the commercial centers of the United States in favor of the trade acceptance, and its use is increasing. See next page.

TRADE DISCOUNT. See DISCOUNT.

TRADE-MARK, a mark, sign, device, word, or picture printed or stamped on manufactured goods for purposes of identification. It may be registered in the Patent Office and its use prohibited to all except the owner.

TRADE ACCEPTANCE

No 76

Chicago, Ill. July 10, 1934.

To James A. Whitney

Duluth, Minn.

On August 10

Ourselves

One hundred twenty-five - - - - - Dollars (\$125.00)

value of goods by the acceptor from the drawer.

Duluth, Minn. July 1934

Payable to Union National

Bank Location Duluth, Minn.

Payor's Signature James A. Whitney

By Signer Officer Whitney

Bank Woods, Hutchinson

By Woods

A TRADE ACCEPTANCE (SEE PRECEDING PAGE.)

The trade-mark is an outgrowth of a desire on the part of manufacturers to place beyond the range of fraudulent imitation goods for whose quality they have won a reputation, and to afford the public ready means of identifying goods which they have found satisfactory. In olden times, a producer sought to identify himself with the quality of his work; for example, the shoemaker naturally wished to be known as "Tom Jones, the shoemaker." In a small community, nobody ever thought of shoes without thinking of Tom Jones, or of Tom Jones without thinking of the good shoes he made. So long as business was personal, Jones's products needed no other identification. But modern business is not personal; the user of an article seldom knows who made it. Thus there arose a need for a name or a mark which the public could be taught to associate with a certain article.

Although trade-marks have been in existence for centuries, their present importance and legal position are a product of modern industrial conditions. As recently as the middle of the eighteenth century, the English courts declared that a trade-mark did not exist in the sense in which the term is now used; if one man could use a mark, anybody could use it. In 1803 the English courts first attempted to prevent fraudulent use of another person's trade-mark. The first United States statute on the subject of registration of trade-marks was passed in 1870, and was declared unconstitutional; the statute now in force was passed in 1905, and amended in 1906.

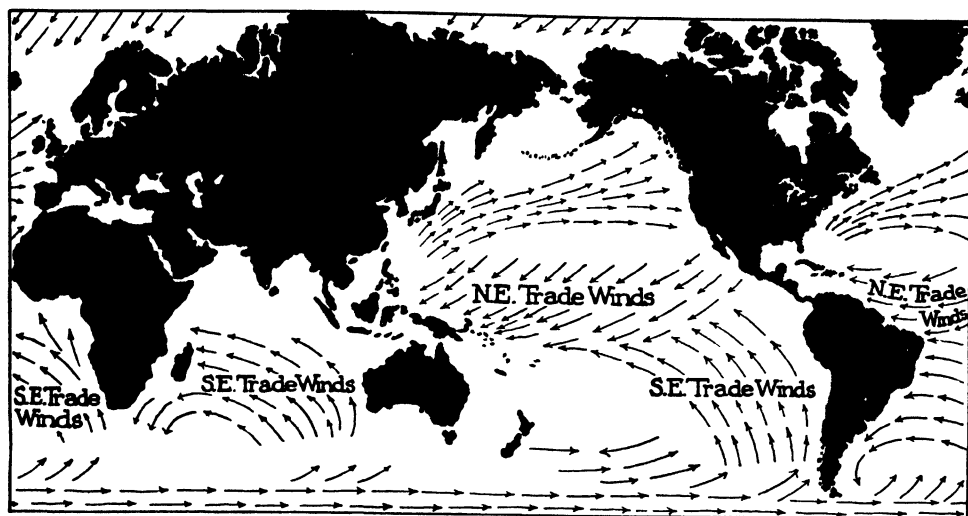
What Constitutes a Good Trade-Mark. Although a trade-mark may consist of merely a signature, a picture, a sentence, or symbol, the selection of what would be considered a good trade-mark is by no means easy. Such expressions as "Superior Hats," "Best Quality Leather," "Finest Teas," cannot be registered as trade-marks. A coined word, suggesting the goods or their qualities, a striking design also

bearing some definite relation to the articles to be marked, or some unique phrase, is usually sought, and so widely advertised do many of these trade-marks become that the sight of them is sufficient at once to suggest the articles, as well as the manufacturers, for which they stand.

Value of Trade-Marks. It would be quite impossible to state the value that attaches to certain trade-marks. Were it permissible to mention specific articles, the following illustrations would perhaps be more forceful. A competitor of a stove-polish-maker whose trade-mark is known in every home offered a million dollars solely for that trade-mark. He did not want his rival's factory nor his selling organization—simply the name was required—but the successful company placed a higher value upon the device, and would not sell. The soap business presents at least three instances of immensely valuable trade-marks, one probably so highly valued that no offer could secure it. Everybody knows the photographic apparatus for which a new word was coined; the name of a certain biscuit is better known than any other. The crowing cock and the growling lion, representing certain moving-picture companies, are familiar to patrons of screen theaters.

Term and Cost. In the United States, a person who wishes to secure a trade-mark makes application to the Patent Office, submitting the design he wishes to use, accompanying it with a fee of ten dollars. If his design meets the requirements of the law, the permit is issued; if used continuously, it is valid for twenty years, and is subject to renewal for a like term. The words "Trade-Mark Registered" must be printed with every design.

The British trade-mark laws are similar. Registration of trade-marks has only been permitted since 1875, but during the first part of the nineteenth century, owners were protected by the common-law practice. Between 1905



LOCATION AND DIRECTIONS OF THE TRADE WINDS

and 1919, the statute law was amended and remodeled. Registration in England now grants sole ownership for a period of fourteen years, and for another period of fourteen years, if the owner desires renewal.

In the Dominion of Canada, there are two kinds of trade-marks which may be registered; these are termed *general* and *specific*. A general trade-mark is one used in connection with the business or occupation as a whole; such a trade-mark may be registered on payment of a fee of thirty dollars, and once registered, it endures forever. A specific trade-mark is used in connection with a particular article or class of articles; the registration fee is twenty-five dollars, and the period of protection is twenty-five years, subject to successive renewals for periods of twenty-five years each.

International Regulations. By the Convention of Paris of 1883, the nations which were represented agreed that citizens or subjects of each should enjoy, in all such nations, all the present or future privileges as regards trade names and trade-marks that obtain in their own country. By the Convention of Madrid, in 1891, a trade-mark registered in any one country is thereby registered in all the countries which agreed to the Convention. Great Britain did not sign this Convention, but it has special agreements with nearly every country in the world. Thus a citizen of any country, if he complies with a few simple regulations, secures protection in most nations. E.D.F.

TRADE SCHOOLS. See SCHOOL (Special Schools).

TRADE UNION. See LABOR ORGANIZATIONS.

TRADE WINDS, those winds that blow regularly from about the twenty-eighth paral-

lels of north and south latitude toward a low-pressure belt at the equator. They blow from the northeast in the northern hemisphere and from the southeast in the southern hemisphere. The trades blow very steadily and in a uniform course over the oceans, and in the days of sailing ships, navigators greatly depended upon them. It was the regularity of these winds, especially over the oceans, that gave them their name, the term "trade" being used in its old and obsolete sense of *course*, or *track*. The course of the "trades," as sailors call them, over land areas is more irregular, because of variations in temperature, influence of mountain barriers, and various local disturbances.

These winds are a part of the great system of planetary winds caused by differences in temperature between the equatorial and Polar regions. The great heat of the equatorial region causes the air in the Torrid Zone to become rarer and lighter, and consequently there is an upward current into the higher atmosphere. The surface currents from cooler regions north and south, which flow into the equatorial belt to take the place of the ascending currents of warm air, form the trade winds. The fact that they blow obliquely, instead of directly north and south, is due to the rotation of the earth on its axis. This movement turns them from a straight course, and makes them easterly winds. The belt between the two sets of trade winds is a region of calms, in which sailing vessels in former days sometimes drifted for weeks. The trade-wind zone itself shifts north and south with the seasons.

On land areas, the trades have considerable effect on rainfall. When they blow over lowlands, they take up moisture present in the atmosphere and create barren regions, as in the

case of the Great Sahara and the Central Australian deserts. When they blow against mountain ranges, they are forced upward, and the air on rising is cooled. This causes the moisture to be condensed and rain to fall. The northeast trades, for example, cause the heavy rainfall on the eastern slopes of the Andes and of the Mexican and Central American highlands.

R.H.W.

Related Subjects. See WIND, for diagram of the circulatory systems of the world, and for list of other winds with which the trades may be compared in their cause and effect.

TRADING WITH THE ENEMY. See BLACKLIST.

TRAFALGAR, *traf al gahr'* (in England, *trah-fal' gur*), a low and sandy cape on the southwest coast of Spain, at the entrance to the Strait of Gibraltar. It was off this cape, on October 21, 1805, that the famous battle was fought in which Lord Nelson lost his life (see page 4874). Although the English ships were outnumbered by the combined French and Spanish fleets under Villeneuve and Gravina, the superior skill and confidence of the British secured a decisive victory, the French and Spanish losing nineteen out of twenty-four ships. It was on this occasion that Nelson signaled to his fleet, "England expects every man will do his duty." The battle, although a brilliant victory, ended in gloom, for Nelson was mortally wounded in the hour of his greatest triumph.

Trafalgar, since Nelson's time, has been the name of one of the most important squares in London. On the north side of the square is the National Gallery; on the east the Strand and Saint Martin's Church; on the south Whitehall, the Horse Guards, and the War Office; to the west is the Haymarket, with His Majesty's Theater and Waterloo Place. In the square, guarded by Landseer's lions of Britain, rises a tall column surmounted by a statue, the monument to Nelson, the national naval hero. See NELSON, HORATIO (Nelson Monument); LONDON.

TRAGACANTH, *trag' a kanth*, a gummy substance yielded by the stems of various thorny shrubs of the pulse family, found in Asia Minor, Persia, and Syria. The gum exudes through fissures or cuts in the bark, and is usually marketed in the form of thin flakes. It is of a dull-white or yellowish color, translucent, and horn-like in texture. Tragacanth is used as a soothing remedy for sore throat, as an ingredient in lubricants for chapped hands, and also to impart firmness to lozenges and pills. It is also used in the arts as a substitute for gum arabic (which see).

TRAGEDY, a form of the drama which calls for a serious theme, dignified treatment, and usually a disastrous ending. The word *tragedy* is from Greek words meaning *goat songs*, and

was probably applied to the chants used by the men, clothed in goatskins, who represented the satyrs in the festivals of Bacchus. From the chants tragedy took its rise, and it was developed by the Greeks to a very high point. Aeschylus, Sophocles, and Euripides had each a great part in this development. The Greeks took their tragedies as seriously as their religion; Aristotle gave as the reason for the existence of tragedy the "purification of the passions through the arousing of fear and pity."

One of the greatest names in the history of tragedy is that of Shakespeare, whose *Hamlet*, *King Lear*, *Othello*, *Julius Caesar*, and *Macbeth* have place among the few tragedies which are of very first rank; for, since tragedy at its best is the highest form of poetry, it could scarcely be hoped that great examples should be numerous. Tragi-comedy is serious drama in which the outcome is happy, Schiller's *Wilhelm Tell* furnishing, perhaps, the best example of this form. Though the great tragedies of the past, presented by great actors, always find a ready hearing to-day, the large majority of theatergoers prefer lighter plays, and the comedies produced far outnumber the tragedies.

Related Subjects. The reader is referred in these volumes to the following articles:

Aeschylus
Comedy

Drama
Euripides

Shakespeare
Sophocles

TRAGOPAN, *trag' o pan*, a handsome bird of the pheasant family, found in the region of the Himalayas, dwelling in forests high up on the mountain slopes. It is noted for bright,



THE TRAGOPAN

About one-tenth actual size.

variegated plumage, and for two fleshy protuberances which hang behind the eyes. In the breeding season, the male woos his mate by proudly erecting and distending these protuberances until they have the appearance of

horns. The male bird also possesses two large wattles, which hang at the sides of the lower mandible, and these are likewise displayed conspicuously in the wooing antics. Tragopans feed on insects, leaves, fruits, and seeds, and they nest in trees. The eggs, which are white, slightly speckled with dull lilac, resemble those of the common fowl. The birds are shy and are usually taken by snaring, being slowly driven toward nooses placed in openings near the point of two converging lines of hedge. D.L.

Classification. There are five species, belonging to the family *Phasianidae*. The best-known species is the crimson tragopan, or horned pheasant, of India, *Tragopan satyrus*.

TRAILING ARBUTUS. See ARBUTUS.

TRAIL, trawl, CATHERINE PARR (1802-1899), a Canadian novelist, known for her vivid sketches of pioneer life in Canada. Mrs. Traill was born in London, England. She was the third of the literary Strickland sisters; the two elder, Agnes (1796-1874) and Elizabeth (1794-1875), were known for their historical writings for children, and a younger one, Susanna, gained a reputation as a novelist and poet of Canadian life (see MOODIE, SUSANNA). In 1832, after her marriage to Lieutenant Thomas Traill, Catherine emigrated with her husband to Canada, and settled in the backwoods of Ontario. The pioneer's trials she portrayed in many novels and sketches.

Her Writings. These include *Backwoods of Canada*; *Canadian Crusoes*; *Rambles in the Canadian Forest*; *Pearls and Pebbles, or, Notes of an Old Naturalist*; and *Studies in Plant Life in Canada*.



RAILS OF EARLY DAYS. Recent decades have witnessed a widespread movement for good roads in the United States and Canada. What is understood by a good road to-day is a hard-surfaced roadway, wide enough for two or more lanes of traffic, with moderate grades and curves, and running in as direct a course as possible. The immediate cause of the universal demand has been the development of the automobile as a common means of travel. The efficiency of this swift machine has made it necessary that roads adapted to its use be built everywhere.

In the pioneer days of America, the need for roads was even more imperative. Before the days of the railroad, the horse was the chief motive power for the transportation of goods and people. Boats were used wherever there

was water, but most of the localities had to be reached by land. The problem of making roads to the interior from lake and ocean shores was a critical one for the early inhabitants. The opening up of new settlements, the expansion of trade, and the progress of national life, all depended upon the existence of passable roads.

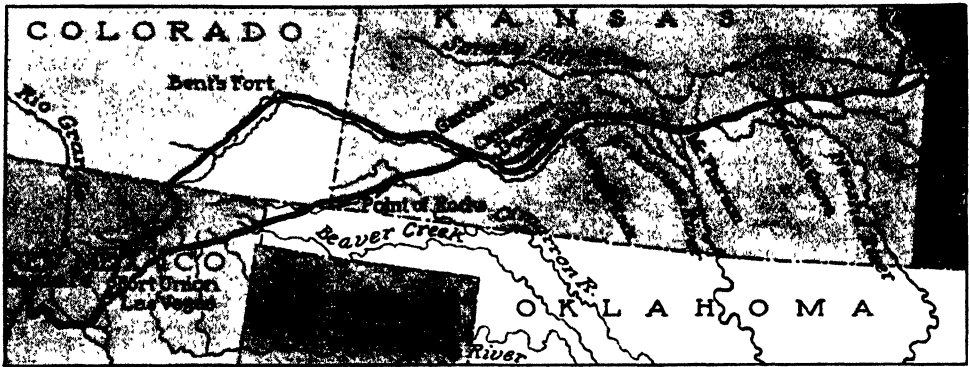
The earliest roads were Indian trails, which were little more than paths through the wilderness. They could be followed on foot or horseback, but were not suitable for wheeled vehicles. When the early settler set out for a new part of the country, he needed his wagon as a means of conveying his goods and family. The difficulties which he encountered were often so great that both courage and resourcefulness were required to overcome them. Trees had to be cut down and removed, streams forded, and forbidding mud negotiated. Yet such was the spirit of the pioneers that they advanced in spite of all obstacles.

Road-making passed through three periods. The first stage was that of locating the roads and clearing off the timber. Holes left by the removal of trees were filled with brush and stones. The dirt surface was soon worn into ruts and bumps, and in wet weather, mud was always to be reckoned with. These roads, crude as they were, enabled the pioneer to go to market and to do the limited traveling which his busy life permitted.

The second stage was that in which either gravel or planks were used to build hard-surfaced roads called turnpikes. Private capital was employed for their construction, though, in some cases, the Federal or a state government assisted by granting a subsidy. Toll was collected from all users of the turnpike, in order to repay the construction cost. In the eastern part of the United States, many turnpikes were built. One of the most famous was the Lancaster Pike (see below).

Stagecoaches were operated on the turnpikes, to carry passengers and mail. At frequent intervals, inns or taverns were established to provide meals and lodging; for no one was expected to travel at night. The trip from New York to Philadelphia, ninety-six miles, was made in a day and a half. The fare was six dollars, and the traveler had to pay the charges for meals and lodging besides. Delays on account of bad weather were frequent, and even in good weather the swaying and jolting of the stagecoach was an ordeal not soon forgotten. It is not surprising that the railroad made such headway, once it was introduced. From about 1840, stagecoach traffic gradually declined, and the locomotive began to conquer distance with comparative ease and speed.

The third period of road-building, which extends down to our own day, was that in



THE OLD SANTA FE TRAIL

which the work was undertaken by public agencies, and both the construction and maintenance of highways were financed from the public treasury. For a full description of modern road-building, see **ROADS AND STREETS**.

Some of the early pioneer trails are listed below. Their chief interest lies in their influence on the opening up and settling of new regions, though some of them were built for military purposes.

Braddock's Road. It extended from Cumberland, Md., to Pittsburgh, Pa. It was built in 1755 by the English General Braddock, to enable his army to advance from Virginia against the French on the Ohio River. The distance was 110 miles, and it was through a rough and difficult section. The Allegheny Mountains, as well as many creeks and rivers, had to be crossed. It became one of the main roads to the Ohio Valley, and later some parts of the Cumberland Road were built on its roadbed.

Cumberland Road. See article, page 1784.

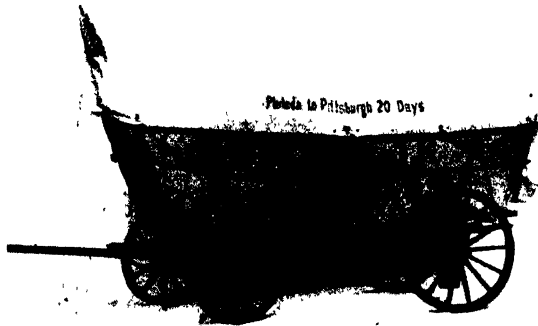
Lancaster Turnpike. This road was built in 1792-1794 from Philadelphia to Lancaster, Pa., a distance of sixty-two miles. It was built of stone, at a total cost of \$465,000. The roadway was thirty-seven feet wide, of which twenty-four were laid with stone. This was the first chartered turnpike in America. Its construction marked a new era in transportation, and created the problem of the control of public corporations by legislative restrictions.

Mohawk Trail. This was a route through Central New York from Albany to Buffalo. Its eastern course was through the valley of the Mohawk River. Its great advantage to New York was that it gave a level route to the Great Lakes and the West. To-day, the New York Central Railroad follows the course of this historic roadway, and a modern automobile highway traverses the attractively scenic valley.

Oregon Trail, also called the **Overland Trail.** This road extended from Independence, Mo., to the Columbia River, a distance of 2,000 miles. Its general course was through Nebraska, Wyoming, Idaho, and Oregon. At Granger, Wyo., it branched to the southwest and ran through Utah and Nevada to San Francisco. The Lewis and Clark Expedition of 1804 added to the knowledge of its western section. The first wagon train was taken over it by Sublette, in 1830. In 1842 John C. Fremont surveyed the route under the authority of the Federal government. It came into such general use that, in 1845, more than three thousand emigrants to the West passed over it.

The famous motion picture, *The Covered Wagon*, recounts the adventures of a caravan moving westward over this route.

Pennsylvania State Road. This route runs from Philadelphia to Pittsburgh, and includes, in its eastern section, the Lancaster Pike. In 1758 General John Forbes built the western half of it, to give access from the East to Fort Duquesne (Pittsburgh). He proceeded from Philadelphia by way of Carlisle



THE CONESTOGA WAGON

Among American inventions, the Conestoga wagon, which became a familiar object on American trails, must forever be remembered with respect. Originating in the Lancaster region of Pennsylvania and taking its name either from the horses of the Conestoga Valley or from the valley itself, this vehicle was unlike any other, because of the curve of its bed. This peculiarly shaped bottom, higher by twelve inches or more at each end than in the middle, made the vehicle a safer conveyance across the mountains and over all rough country than the old straight-bed wagon. The Conestoga was covered with canvas, as were other freight vehicles, but the lines of the bed were also carried out in the framework above and gave the whole the effect of a great ship swaying up and down the billowy hills. The wheels were heavily built, and had tires four and six inches in width. The color never varied: the underbody was always blue, and the upper parts were red.

—From *Hilbert's Paths of Inland Commerce*.

and Chambersburg. Continuing westward, he established Forts Bedford and Ligonier, and then pushed on to Pittsburgh. The forests and mountains of this section made the undertaking so difficult that the achievement was memorable in pioneer annals. The road is sometimes referred to as Forbes Road. It was used by thousands of emigrants to the country beyond the Alleghenies.

Santa Fe Trail. This was one of the longest roads of the period that preceded the railroads. From Independence, Mo., to Santa Fe the distance was 850 miles. By way of the Cimarron cut-off (see map), it was 775 miles, but the longer way was much safer. An expedition under Captain Becknell, in 1821, marked the beginning of wagon traffic, though trips had been made between these points as early as 1804.

Because of conflicts with the Indians, the trips were usually made by a party large enough to defend itself. Sometimes United States troops accompanied the caravans. A wagon train usually consisted of twenty-six wagons, each drawn by ten oxen or mules. Each wagon carried a load of about six thousand pounds, and a day's journey was seventeen miles. For many years, the traders made only one trip a year, but by 1860 there were trains leaving every few days.

The first stagecoach made the trip to Santa Fe in 1840. The time required for a regular run was two weeks, and the fare was \$250.

In 1830 the route was extended to California by William Wolfskill. It was by way of Green River, Utah, and the Virgin River, and was known as the Old Spanish Trail. The road to Los Angeles was surveyed by Lieutenant Beale of the United States army, in 1857-1858. It extended from Fort Defiance, Ariz., to Los Angeles, and continued in use as late as 1878.

Wilderness Road. This was a route from the Shenandoah Valley, Va., through the Cumberland Gap to Kentucky and Tennessee, opened up by Daniel Boone in 1775. Due to the rugged and mountainous character of the country through which it ran, it was called "the longest, blackest, hardest road" of pioneer days in America. It was also known as Boone's Trail, the Kentucky Road, and the Virginia Road. It opened a way for the settlement of Kentucky, and for westward migration from Virginia.

E. U. G.

[The reader is referred to the article TRANSPORTATION.]

TRAIN, ARTHUR, (1875-), an American author and lawyer, whose stories combine a philosophical appreciation of the fundamental principles of jurisprudence with a sympathetic view of life. He was born in Boston and was graduated from Harvard Law School in 1899. After a quarter-century of prominence as a member of the bar in Massachusetts and New

York, including service as an assistant district attorney, he abandoned the legal profession to devote his entire time to literature, a field which he had entered in 1905.

His Books. *McAllister and His Double*, published in 1905, was followed the next year by *The Prisoner at the Bar*, which established its author's reputation as a writer of fiction in which some phase of the law was used as a plot. Among the later works from Train's pen are the following stories: *The Butler's Story*; *Mortmain*; *C. Q.*, or *In the Wireless House*; *The Goldfish*; *The World and Thomas Kelley*; *The Earthquake*; *Tutt and Mr. Tutt*; *By Advice of Counsel*; *The Hermit of Turkey Hollow*; *As It Was in the Beginning*; *Tut, Tut, Mr. Tutt!*; *His Children's Children*; *The Needle's Eye*; *The Lost Gospel*; *Page Mr. Tutt*; *The Blind Goddess*; *Highwinds*; *When Tutt Meets Tutt*; *Paper Profits*; *The Blind Goddess*; and *On the Trail of the Bad Man*, which explains his reasons for quitting the bar. *The Man Who Rocked the Earth* was produced by Train and Robert Wood.

TRAINING CAMPS, MILITARY, camps for the training of young men in the principles and practice of warfare. The small number of men trained for war received little attention from the American government or public until 1913, when the army, through the influence of Major General Leonard Wood, established two military-instruction camps for college and university students and high-school graduates. They were received so favorably that four were conducted in each of the two succeeding years.

At the outbreak of the World War, four camps were established for business men, known later as the Plattsburg Camps, after



Photo. P & A

"MADONNA OF THE TRAIL"

Design accepted by the Daughters of the American Revolution as a model for twelve statues to be erected in the states of Maryland, Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Missouri, Kansas, Colorado, New Mexico, Arizona, and California, commemorating the bravery of the early women on the Western trails. Each statue will be eighteen feet in height.

the largest one, at Plattsburg, N. Y. Under the National Defense Act of 1916, twelve camps, both of the student and of the business-men type, were held in that summer throughout the United States, with an attendance of 16,134. The men who attended these camps formed a nucleus of trained civilians, with which to begin the great task of developing 200,000 officers when the United States entered the war. In the spring of 1917, the Federal government took over more fully the training of officers for the war, and maintained camps for them in 1917 and 1918. In addition, units for student army-training corps were established at colleges and universities in 1918; after a few months of training, students were to be assigned to military duty at officers' training schools. These plans were cut short by the signing of the Armistice, but the principle has been continued in the units of the Reserve Officers' Training Corps (which see), now maintained in many schools and colleges.

An amendment to the National Defense Act (1916), passed in June, 1920, provided for military training camps for warrant officers, enlisted men, or civilians who might volunteer to take the training. In accordance with this provision, the first Citizens' Military Training Camps were held in the summer of 1921. There were twelve of these camps, distributed among the nine corps areas into which the nation was divided. The enrollment was 10,681; of these, 9,914 completed the course of instruction.

The training is open to young men between the ages of seventeen and twenty-four years, who are of good character and sound physical health. They must be citizens of the United States; or, if of foreign birth, they must furnish evidence of application for naturalization (first papers).

The work of enrollment is handled by the Military Training Camps Association, which is a civilian agency of the War Department. The Association consists of an executive committee, corps-area aides, and state aides to the Secretary of War. The latter select chairmen in the various counties of their states, and through them enrollment for the camps is brought within the immediate reach of young men of suitable age and character. Actual acceptance for the camps is made by the commanding general of each corps area.

In 1922 Congress appropriated \$1,800,000 for citizens' military training camps of thirty days' duration, to be held at twenty-seven places in the United States. The number grew in subsequent years to a total of fifty-two camps, Congress increased its appropriation, and now nearly 40,000 young men attend the camps in the army-corps areas each summer. The course of instruction is divided according to the branch of service selected by the applicant, and, on its successful completion, those

men who are eligible receive the commission of second lieutenant in the Reserve Corps. G.F.J.

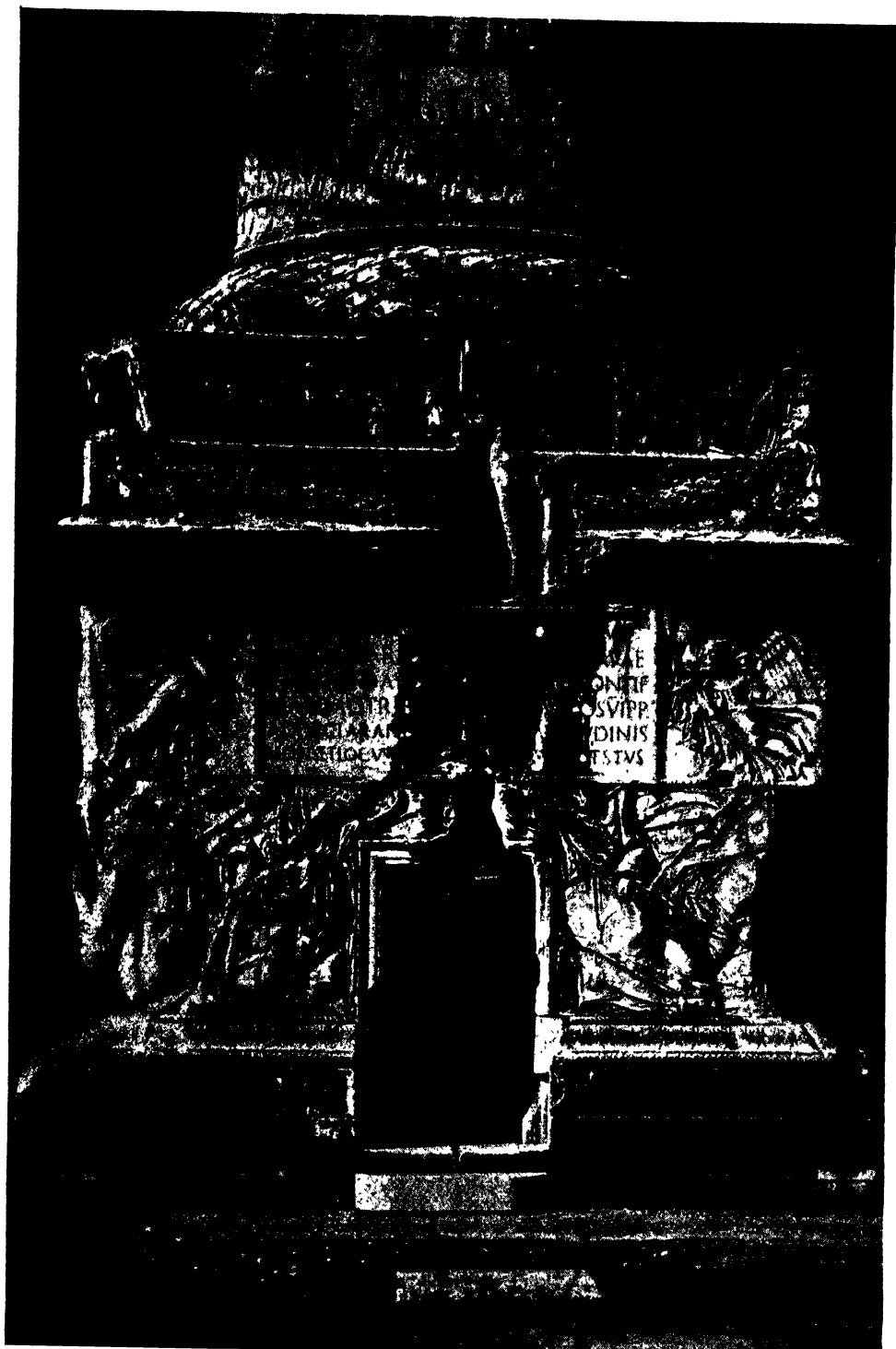
TRAJAN [MARCUS ULPUS TRAIANUS] (52 or 53-117), one of the "five good emperors" of ancient Rome, and, among military leaders, one of the most important in the history of the empire. He was born near Seville in Spain, of a Roman family. His father was a common soldier of the legion, who fought his way up to the consulship and the governorship of Asia.



ARCH OF TRAJAN

The young Trajan was given a military education, and won distinction as a military tribune in Spain, in Syria, and in Germany. In 97 Nerva adopted him as his son and successor, and in the next year he became emperor. Citizens and soldiers were propitiated by gifts, and the Praetorian Guard was divided and scattered among the legions, that its power might be lessened. Trajan was extremely popular with his troops, even though he exercised the strictest control over them.

Much of his reign was spent away from Rome in campaigns on the frontiers of the empire. Dacia and Armenia were conquered and made provinces, and Syria, Mesopotamia, Arabia, and Parthia, which had become almost independent, were again reduced to submission. In 106 Trajan celebrated at Rome a splendid triumph, and instituted games which lasted for four months, during which 10,000 gladiators and 11,000 beasts are said to have perished in the arena. Seven years of peace followed, dur-



Trajan's Column. The present-day appearance of the base of the Column of Trajan. The removal of a rectangular stone in the base revealed a door which led to the supposed burial vault.

ing which Trajan built his Forum, which was the glory of Rome. He also built new roads and aqueducts, new harbors on the coast, and encouraged agriculture. Although in the main a military ruler, Trajan spent much time and money beautifying Rome; he lessened taxes, corrected abuses in the laws, and improved the administration of the provinces. While believing in religious toleration, he permitted a mild persecution of the Christians.

Trajan's Arch. In A.D. 114, in commemoration of the opening of a new road to Brundisium, Trajan caused a marble arch to be erected at Benevento, where it now stands, one of the best-preserved monuments and one of the finest examples of the Roman arch. The archway is twenty-seven feet high, the whole structure of white marble being fifty feet in height, and decorated with figures in relief illustrating the triumphs of Trajan over the Dacians.

Trajan's Column, a beautiful column erected by the Senate and people of Rome in A.D. 114, in honor of Trajan, the victorious emperor. The pedestal is covered with sculptured trophies of his victories, and, winding spirally around the column for hundreds of feet, are bas-reliefs forming a remarkable record of the Dacian wars. The column is still standing, in a state of splendid preservation, among the ruins of Trajan's Forum in Rome. The column itself is 100 feet high, and was formerly surmounted by a colossal figure of Trajan, which was replaced in 1588 by a statue of Saint Peter. In the interior of the column is a spiral staircase leading to the summit. Although the ashes of the emperor in a golden vase are said to have been deposited beneath this column, no trace of them has been found; but a chamber that may have served as the burial vault was found under the column. See illustration, page 7241.

TRANCE, *trans*, a term used very loosely, as a rule, to describe any kind of semi-consciousness or sleeping state that is abnormal. Even in medical literature, the word is not clearly defined. Originally, its use implied a belief that the soul of the person in a trance was temporarily withdrawn from the body. Now, however, the word is applied to a variety of sleeplike states, including ordinary sleepwalking, the deeper stages of hypnosis, extreme cases of lethargic melancholy, and the condition into which spiritualistic mediums seem to fall, almost at will. There are no distinctive physical symptoms of the trance state, but in many cases the pulse and respiration are slowed, and the reflexes are also affected, sometimes disappearing altogether. Two different states appear to be best entitled to the name of trance; namely, first, the trance of mediumship, and, second, what has been called the ecstatic trance. The latter state may be self-induced through excitement, especially of a religious nature, and is usually characterized by an outward appearance of rapt contemplation. On returning to a normal state, the subject usually remembers the nature of his vision or other ecstatic experience.

Modern science regards the mediumistic trance, with its seemingly profound sleep, but continued capability of speech and writing, as a state similar to deep hypnosis; while the ecstatic trance is regarded as a case of hallucination, induced by prolonged occupation of the mind with some exciting idea or image which temporarily monopolizes the emotions. J.J.

TRANSCAUCASIAN, *tranz kaw ka' shan*, **SOCIALIST FEDERATED SOVIET REPUBLIC**, a government comprising the communistic states of Armenia, Azerbaijan, and Georgia, lying east of the Black Sea. It is one of the members of the Union of Socialist Soviet Republics, the legal designation of Russia and affiliated republics. The capital is Tiflis.

[Each of the foregoing states is described under its title in these volumes. See, also, **RUSSIA** (Size and Location).

TRANSCENDENTALISM, *tran sen den'-tal iz'm*, a term applied to any philosophy, based on a spiritual interpretation of the universe, which makes absolute knowledge practicable. The term is associated particularly with the idealistic philosophy of Immanuel Kant, who distinguished between transcendentalism and the transcendent. Its original conception was that of Duns Scotus. Kant's ideas were taken up and expounded in England by Carlyle and Coleridge. Later, they inspired the movement in America known as New England Transcendentalism. Ralph Waldo Emerson was its most celebrated exponent, and others identified with it were William E. Channing, Margaret Fuller, George Ripley, Theodore Parker, and Henry D. Thoreau. The American Transcendentalists represented a reaction against Puritan philosophy.

The basic principle in their philosophy was the supremacy of mind over matter, and of the intuitions over tradition and established creeds. According to them, knowledge of all things beyond the boundaries of experience—such as religion—is revealed to the individual through his own consciousness. In fact, the formalism of the Unitarian Church was largely responsible for this movement. Followers in the movement were interested in social and political reform, as well as in religion and philosophy. Women's rights, temperance, prison reform, abolition of slavery, and vegetarianism were a few of the subjects they discussed. Their belief that a number of people could live happily together on a communistic plan was tested in the establishment of Brook Farm, near West Roxbury, Mass. (see **BROOK FARM**). Their ideas found published expression between 1840 and 1843 in a journal called *The Dial*, of which Emerson was the editor. It was Emerson who was responsible for the success of the movement.

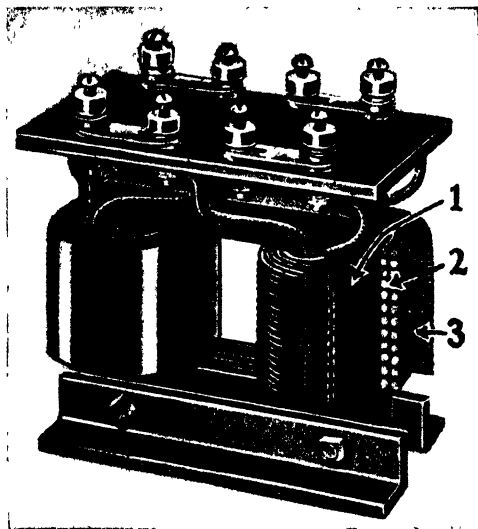
TRANSCONTINENTAL RAILROADS. See **RAILROAD** (Railroads in the United States).

TRANSEPT. See CATHEDRAL (Cathedral Architecture).

TRANSFIGURATION, THE. See illustration under JESUS CHRIST.

TRANSFORMATION OF ENERGY. See ENERGY, subhead.

TRANSFORMER. In carrying electricity from one point to another through wires, it is cheaper, and in other ways more desirable, to have a high voltage rather than a low one, and for actual work in lighting and in driving



A TRANSFORMER

(1) Laminated iron core (2) Primary circuit (3) Secondary circuit

machinery, only a low voltage is ordinarily practical. By the use of a device called a *transformer*, it is possible to generate a low voltage, increase it for transmission, and decrease it again for service. The principle of the transformer is simple. Faraday, in 1831, discovered that if a current is sent in alternating directions through a wire it causes an electromotive force in a near-by wire. Thus, if a hollow square, or core, of iron has the wires of one circuit wound around one side, and those of another circuit around the other, a transformer is created. If an alternating current is sent through the first circuit, it causes shifting lines of magnetic force, which induce in the other circuit an electromotive force in the other direction. In general, if there are twice as many loops of wire in the first as in the second coil, the voltage of the second coil will be cut in half and its amperage doubled. In some transformers, the core is outside of the coils.

H.S.E.

Related Subjects. A transformer is one form of *induction coil*. See the article on that subject, and those on

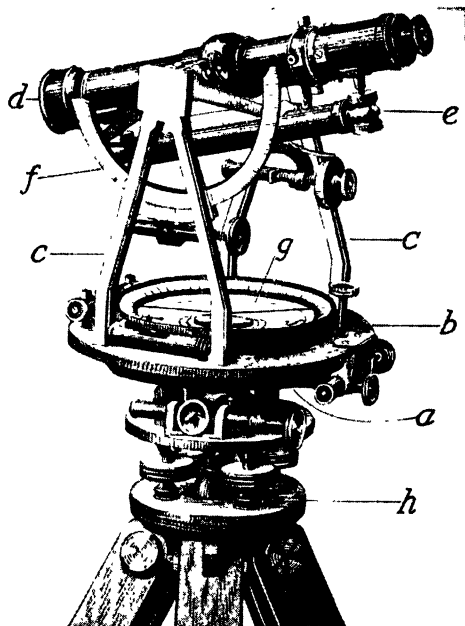
ELECTRICITY; AMPERE; VOLT; MAGNET AND MAGNETISM; DYNAMO, RADIO COMMUNICATION (Glossary of Radio Terms)

TRANSFUSION OF BLOOD. See BLOOD, subhead.

TRANSIT, in astronomy, the crossing of one heavenly body over the disc of a larger one, as seen from the earth. The transits of Venus and Mercury, whose orbits are between the sun and the earth's orbit, have been studied with great interest by astronomers. See discussion of these transits under MERCURY and VENUS.

F.B.L.

TRANSIT, the instrument most generally used by surveyors and civil engineers for measuring angles, determining bearings, and doing leveling. The chief parts of the transit are shown in the illustration. Two circular plates, *a* and *b*, usually of brass or copper, are mounted independently upon the same axis, so that the upper plate will revolve upon the lower. Supports, *c* *c*, are attached to the upper plate to support the telescope, *d*, which moves upon a horizontal axis. The level, *e*, is attached to



TRANSIT INSTRUMENT

The figure is explained in the text.

the telescope, and a graduated vertical circle, *f*, is attached to the axis. Beneath the telescope is a magnetic needle, *g*, which moves over a dial graduated in degrees, minutes, and seconds. The edge of the lower plate is also graduated, and the upper plate carries a pointer. Verniers are also attached to both the horizontal and vertical scales, so that the slightest movements can be easily read. There

are numerous other screws and lines for adjustment of the instrument, but their description is not essential to an understanding of its workings. The apparatus is attached by a toggle joint to a brass plate, *h*, which is fastened to the tripod. See SURVEYING; THEODOLITE.

TRANSJORDANIA (also written **TRANSJORDAN**), so named because of its location across or beyond the Jordan River, is a section of Arabia, governed, since 1923, by an independent Arab administration subject to the control of the British mandate over Palestine, with the approval of the League of Nations. Before the World War and the successful revolt of the Arabians against Turkey, it was a Turkish governorship under the vilayet (province) of Damascus. Although its exact boundaries are not determined, it may be located by the countries surrounding it. Palestine, the Dead Sea, and the Jordan River lie to the west, and Syria to the north. To the east is Iraq (Mesopotamia), and to the south lie Hejaz and Nejd.

The population is about 300,000, of which more than 200,000 are Arab Moslems. There are about 40,000 Arab Christians of various sects, and 30,000 Circassians, the latter in colonies planted there by the Ottoman government, after the Russo-Turkish War of 1877-1878. Approximately half the population is nomadic, while the other half live in villages and small towns, chief of which are Amman, the capital, with 20,000 population; Es-Salt, Kerak, Irbid, and Maan. Most of the country is desert, almost the only arable region being a thirty-mile district between the Jordan River and the Hedjaz railroad. Agriculture and cattle-raising are the chief occupations; the recovery of salt, potash, and phosphate from the Dead Sea promises to become an important industry. A motor road from Amman to Jerusalem, and a portion of the Hedjaz railroad running through the country, are the only modern means of transportation.

History. For centuries, the sands of Asia Minor have shifted under the march of desert caravans and the tramp of conquering armies. It was an important part of the ancient world. Nomads in the time of the Jewish prophets wandered across the lands of Moab, Edom, and Gilead, which are now part of Transjordan. Greek and Roman armies and colonists built flourishing outposts of their civilization there. It was the battleground of the soldiers of the Cross and of the Crescent, conquered first by the Moslems, then for many years a province of the French Crusaders. Saladin's brother captured Kerak in 1188, and after he became sultan of Egypt, there came a long succession of Egyptian rulers. From the sixteenth to the twentieth century, Turkish misrule laid waste the wealth of the country.

The World War and the resulting disorganization of the Turkish Empire presented an opportunity for Arabian independence. In April, 1918, the Bedouins, under the leadership of the Hashemite family, and inspired by the famous British officer and Orientalist, Colonel Lawrence, rebelled against the Turks. In September, 1918, the Turkish garrison of Maan surrendered to the British, marking the end of the Ottoman period, and by the Versailles Peace Treaty (1919), this territory was made part of the Palestine mandate under the supervision of the British High Commissioner of Palestine. During the revolt, the Hashemite family, the royal family of which King Hussein of Hejaz (later deposed) was the head, secured Great Britain's guaranty that the success of the rebellion would make Arabia independent. As a result of this promise and of the treaty, Emir Abdullah was approved by the British as ruler of the Trans-Jordan territory, with his capital at Amman and a money grant from the British to assist him in establishing an efficient administration. He was the son of King Hussein and brother of King Faisal of Iraq (Mesopotamia).

In May, 1923, local autonomy was formally granted to the territory, provided it should conform to constitutional principle, and receive the approval of the League of Nations. This condition was not fulfilled until later.

Transjordan may now be considered as a practically independent nation, but it must remain subject to the conditions of the mandate over the country given to Great Britain by the League of Nations (see **MANDATED TERRITORIES**). British interests are lodged in the office of a High Commissioner; because of duties which pertain jointly to Transjordan and Palestine, one High Commissioner serves for both countries.

In November, 1927, a treaty was signed between the British government and Abdullah, by which the independence of the Transjordan government was formally recognized, but with stringent control in all departments of the administration. An elective legislative assembly was provided, to control Abdullah.

Occasional trouble has occurred since the treaty, which was unpopular, and some of the Bedouin tribes of Transjordan were restless during the anti-Jewish troubles in Palestine in 1929, which were subdued by the British forces.

Related Subjects. The reader is referred in these volumes to the following articles:

Arabia	Hejaz	Nejd
Dead Sea	Jordan River	Palestine

TRANSMIGRATION OF THE SOUL, the belief that the soul, after the death of the body, passes into the bodies of lower animals or the bodies of other human beings, for purification. It presupposes immortality. Among the Brahmanic Hindus, it has its foundation



Photos: U & U

In Picturesque Transjordan. Above, Bedouin sheiks at the door of the ruler's palace. Below, typical city architecture; the town shown is Es Salt, near the boundary of Palestine.

in the belief that the soul must do penance and be cleansed before its return to God, the source of all things. The Buddhists believe that the soul must be free from passions and desires, which may necessitate many incarnations, before it reaches Nirvana, or absorption into the stream of universal consciousness (see **BRAHMANISM**; **BUDDHISM**).

The likeness between parents and children, and the phenomenon of atavism, are attributed by some to such a reincarnation. The general idea is that one must live again, to atone for previous sin.

In ancient Egypt, the belief was closely connected with the system of animal worship. The Egyptians believed that the soul, after the death of the body, must have a tangible habitation, and that the souls of the gods might dwell for a time in certain animals set apart as sacred. The soul of Osiris, for example, was believed to live in the body of a sacred bull. Transmigration of the soul was also taught by the Greek philosophers Pythagoras and Plato, and Caesar tells us that the belief was current among the Gauls. A few minor religious sects have at various times accepted the idea, but Christianity rejects it.

TRANSMITTER. See **TELEPHONE**; **RADIO COMMUNICATION**.

TRANSMUTATION OF ELEMENTS. See **ALCHEMY**; **CHEMISTRY** (The Elements).

TRANSPIRATION. See **EVAPORATION**; **LEAVES** (The Work of the Leaf).

TRANSPLANTING. See **TREE** (Planting Trees).

TRANSPORTATION. The present generation is infinitely more fortunate in its means of rapid transit than any that has preceded it. Seldom is it brought to mind that, for many hundreds of years, man's inventive genius did not advance the nations in their methods of communication. George Washington could not travel to and fro in the fringe of colonies along

the Atlantic seaboard more rapidly than Julius Caesar could cross his dominions, or King Solomon could venture beyond his capital city.

Travel with ease and swiftness has been one of the amazing developments of about a century. The nineteenth century lifted man above hundreds of years of snail-like progress in transportation; then, in less than the first third of the twentieth century, came high realization of man's efforts to reduce time and space.

Only a little more than a century ago, the *Clermont* of Robert Fulton, boldly discarding sails, steamed laboriously up the Hudson River. The feat opened a new era in transportation; yet what man of Fulton's day, watching that boat, could have pictured a future when hundreds of steamship lines would mark out countless ribbons of traffic lanes around the earth?

The locomotive is only about a hundred years old; it displaced the work of men and horses, brought communities nearer together, and had a part in fix-

ing the destiny of at least two nations. British Columbia refused to become a member of the Dominion of Canada unless a railroad were built to join it to the Eastern provinces. Except for the building of the Pacific railroads across the wastes of the Western United States, there would probably have been two nations—possibly three—instead of one, south of Canada between the two great oceans. The first railroads barely exceeded the speed of a horse, but steam had unmeasured potentialities.

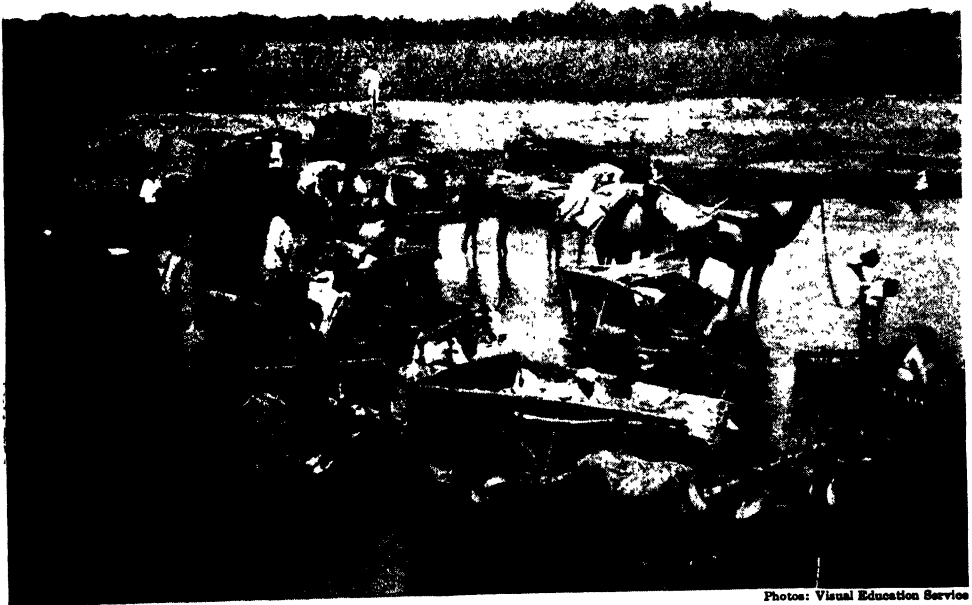
Airplanes and airships have crossed the ocean. One of the former, with a single motor, under the practical hand of Lindbergh, covered the distance between New York and Paris, without stop, in a day and a half. The *Graf Zeppelin*, rigid airship, a year later, proved not much speedier than fast ocean vessels, but, after the lapse of another year, it girdled the globe in record-breaking time, and the Zeppelin air lines are yet in their infancy. The vistas



Photo: Visual Education Service

IN THE HEART OF AFRICA

Native bearers burdened with the stores of a white man's expedition.



Photos: Visual Education Service

In India and Burma. All over India rude carts with wooden wheels are drawn by cattle. Below, a caravan of camels and cattle are crossing a stream in Burma.



Photo: Visual Education Service

RAPID TRANSIT IN INDIA

A camel carriage, photographed near Delhi, the capital city.

of air travel present an alluring prospect. Engineers prophesy the crossing of the American continent in a day; they declare they will span the ocean in forty-eight hours.

In ways of which we have yet little conception, the lives of men will be changed by modern transportation. We know now that the automobile is vastly enlarging our knowledge of the nation; for where, not many years ago, thousands of persons seldom went fifty miles

from home, now uncounted thousands find a five-hundred-mile automobile journey an ordinary incident in their lives. By use of the airplane, it is becoming practicable for a business man to live a hundred miles or more from his work. The great spaces which man can dominate are ever widening.

But the whole story of transportation is not to be condensed into man's victories over nature within two or three generations. What



Photo: Visual Education Service

A PRIMITIVE WAGON IN MODERN TIMES

In Nicaragua to-day, water is delivered to users by the means of transportation shown above.



Photos: Visual Education Service

Transportation in China. Above, coolies frequently carry loads of building material on their shoulders for long distances. Below, in the interior of the country passengers are carried laboriously on crude handcarts.

economic need gave rise to the necessity for improved transportation, and what were the laborious steps from crude beginnings?

One-half of the inhabitants of the earth live on less than one-seventh of its surface. That vast populations may have food, clothing, and shelter, the less populous regions must contribute a part of their products to those more



Photo. Visual Education Service

ONE OF THE EARLIEST WAGONS

This is an old Mexican carretta. The inscription on the heavy wooden wheel declares the vehicle to be more than two hundred years old.

densely populated. The necessity for this distribution of material led to the development of the great transportation systems of modern times, by land, water, and air. Before he domesticated the horse, the ox, and the ass, man carried his own burdens; in some regions, like the interior of Africa, all goods are still transported on the backs of men or camels. It was an easy matter to train domestic animals to carry loads, and after some of them had become accustomed to this, to hitch them to sledges.

The next step consisted in affixing wheels or trucks to the sledge and converting it into a cart. Carts could not be used without roads, and men began to improve the paths over which they traveled. Each new vehicle required better roads than its predecessors, and the improvement of roads followed closely upon the improvement of vehicles. The carriage road led to the railway, which, from small beginnings, has been developed into the great systems of the present time. Of still later development is the automobile, now manufactured in a wide variety of forms, and used

both for business and for pleasure. The crowning achievement of modern business is swift aircraft, made to serve the needs of commerce.

Men probably rode upon logs in the water before they made the dugout, which, hollowed out of a log, was the forerunner of the rowboat (see illustration, article CANOE). The sailboat followed the rowboat, and sailing vessels had developed into large ships before the steam engine was applied to navigation. The motor boat has followed the steamboat, and there is scarcely a lake or river within the bounds of civilization that does not have its motor boats. Motors have been enlarged and perfected until 20,000-ton ocean-going vessels are now propelled by motors.

Man's final conquest in transportation is the navigation of the air, in which extraordinary progress has been made since the first decade of the present century.

Closely allied with transportation are the various means of communication—the postal service, the telegraph, the telephone, and radio.

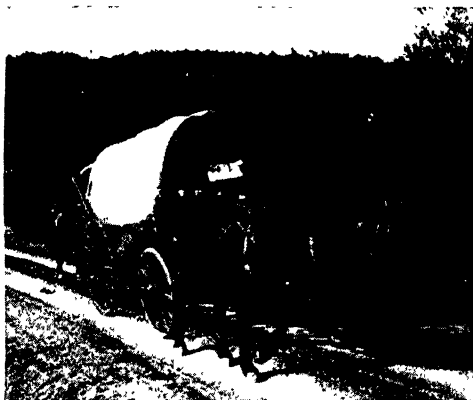


Photo Visual Education Service

A "PRAIRIE SCHOONER"

A familiar means of transportation in pioneer days in the United States. [See illustration, Conestoga wagon, in article TRAILS OF EARLY DAYS.]

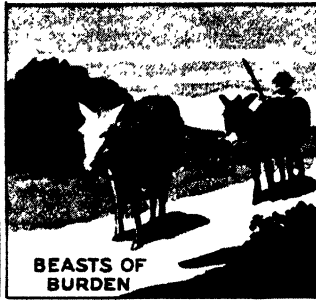
All these have drawn the nations of the earth so near to each other that the most distant ones are neighbors.

E.D.F.

Related Subjects. In connection with this general discussion of transportation, the following articles in these volumes may be consulted:

Aircraft	Main Street of America
Automobile	Monorail, Suspended
Bicycle	Motor Boat
Boat	Motorcycle
Cape-to-Cairo Railway	Ocean (Ocean Routes)
Caravan	Palanquin
Carriage	Pavement
Common Carrier	Pneumatic Tubes
Dixie Highway	Pontoon
Ferry	Railroad
Highway	Roads and Streets
Jinrikisha	Sailboat and Sailing
Lincoln Highway	Ship
Locomotive	Sledge

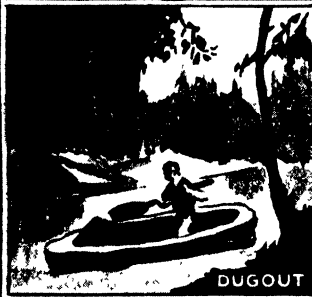
PROGRESS *in* TRANSPORTATION



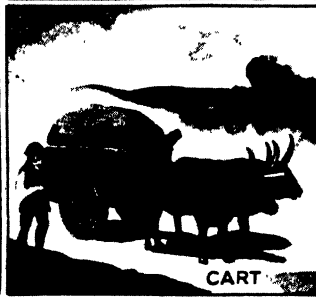
BEASTS OF BURDEN



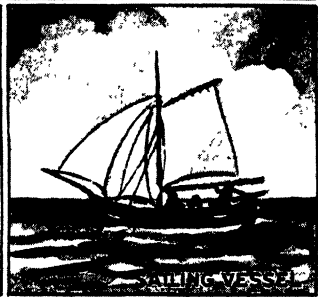
SLEDGE



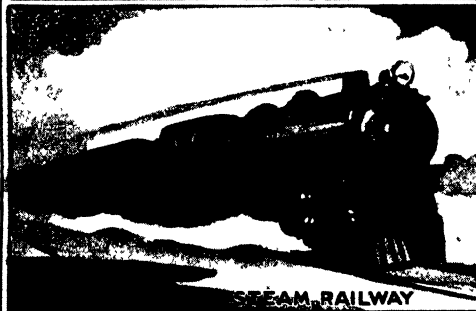
DUGOUT



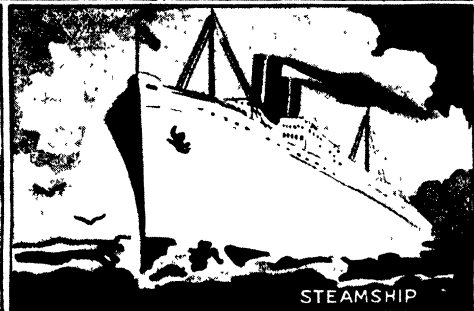
CART



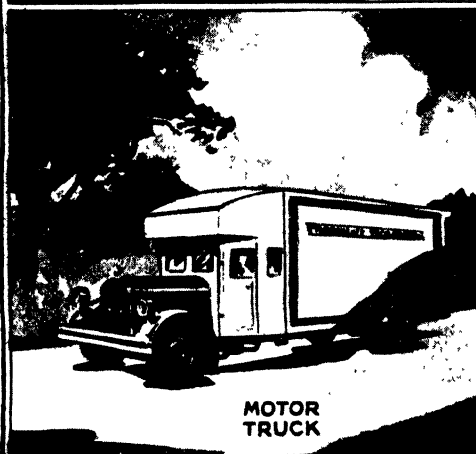
SAILING VESSEL



STEAM RAILWAY



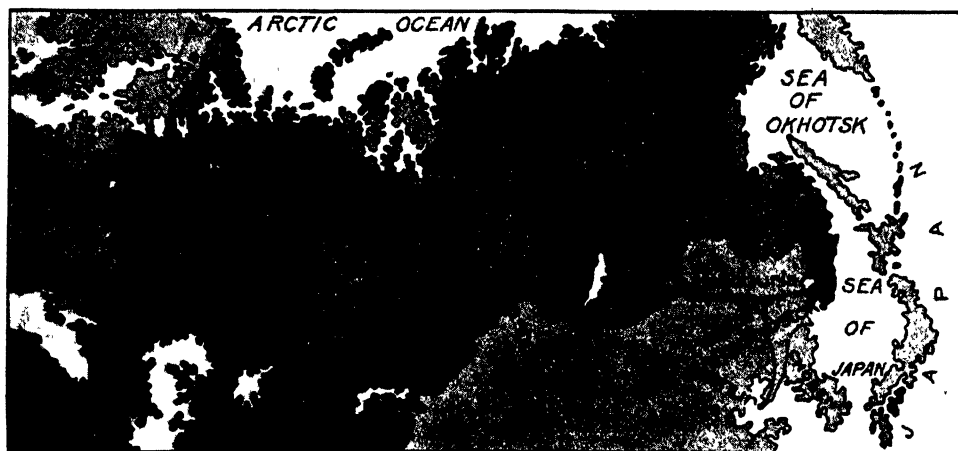
STEAMSHIP



MOTOR TRUCK



AIRCRAFT



ROUTE OF THE TRANS-SIBERIAN RAILROAD

Submarine
Subway
Taxicab
Trails of Early Days

Trans-Siberian Railway
Wagon
Warship

Much interesting information will also be found under the subhead *Transportation* in the articles on the various states and provinces. The illustration of the *Story of Travel*, accompanying the article *RAILROAD*, graphically shows the development of the locomotive.

TRANSPORTATION ACT. See *RAILROAD* (Esch-Cummins Act).

TRANS-SIBERIAN, *si be' rih an*, **RAILWAY**, the longest single railroad in the world, a system connecting the cities of Leningrad and Moscow, and the railroads of Europe, with Vladivostok, the Siberian port on the Sea of Japan. Bisecting the plains of Siberia and Manchuria, it crosses 111 degrees of longitude and extends over one-sixth of the distance around the globe. The distance from Cheliabinsk, on the European frontier, to Vladivostok is 4,500 miles, and from Leningrad to Vladivostok is 5,481 miles. This railway furnishes the shortest and cheapest route between Europe and Eastern Asia. The journey from Vladivostok to Leningrad is made in from eleven to fifteen days; by way of the Suez Canal and the Indian Ocean, the journey from Leningrad to Peking (Peiping) requires forty-five days; and it takes thirty-five days to go by way of New York, San Francisco, and the Pacific.

The building of the railroad marked the dawn of a new era in the development of Siberia. Local industries and foreign trade were stimulated in the rich coal fields of the eastern section, and in the great livestock and agricultural regions of the central and western plains. Just before the World War, the railway was carrying several hundred thousand pioneers into Siberia each year.

The construction of a transcontinental railway joining the cities of European Russia and the Asiatic ports was first planned in 1850,

but, owing to the vastness of the project and its great expense, the government delayed its construction. In 1891 Count Witte (which see), the Russian Minister of Finance, succeeded in obtaining the imperial approval of the road, and work was immediately begun. The construction progressed with unparalleled rapidity; the strictly Siberian section was completed by 1898, the rate of construction averaging two miles each working day. The cost of the entire road was more than \$500,000,000, an amount far exceeding that spent on any other public work in the world, except the Panama Canal.

From Cheliabinsk the line extends across the western and central plains in a general easterly direction, past the great city of Omsk, to Krasnoyarsk, where it bends to the southeast. Beyond Irkutsk it winds east and south around the southern end of Lake Baikal; bending northeast, it then pierces the lofty mountains, and continues east to the Pacific slopes. From Khabarovsk it extends south to Vladivostok. As originally planned, the section between Stretensk and Khabarovsk was to follow the Amur River, but the rough hills and steep grades made it necessary to substitute a line running farther to the south, through Manchuria. This Manchurian section also has a branch extending south to Port Arthur, and connection is made at Mukden with the Southern Manchurian system, affording communication with Peking.

The building of the division around Lake Baikal and across the eastern mountains, known as the Trans-Baikal section, presented vast difficulties, because of the steep slopes and apparently bottomless marshes. The line was opened to traffic before this section was completed, and for three years cars were transferred across the lake by ferry, or in winter on rails laid on the ice. Most of the line was originally

single-track, and though the roadbed was fairly substantial, light rails and inexpensive ties were used. It has been much improved, however, by enlarged sidings, extended sections of double track, and reduced grades. The bridge which spans the Irtysh River at Tobolsk is almost four miles in length, and is considered one of the best railway bridges in the world.

During the Russo-Japanese War, the Trans-Siberian Railway was one of Russia's most valuable assets; it transported 1,000 troops a day to the front, as well as enormous quantities of arms and munitions. In the World War, it was again of invaluable military service, although the enormous demands upon it seriously impaired its equipment. Although supplies were carried from the East to Russia by way of Archangel and the White Sea, the railroad furnished a quicker and safer route, and transported quantities of munitions from the Pacific ports to Russia in Europe. The railway was the chief factor in consolidating Russia's Asiatic possessions, and in extending its influence over that great domain.

More recently, an arrangement was made between Soviet Russia and China for joint control and operation of the line built by Russia across Manchuria, as a short cut to the Pacific port of Vladivostok. In the summer of 1929, the Chinese Nationalist authorities dismissed the Russian railroad men on this line, charging that they had been engaged in Soviet propaganda. A serious dispute ensued between Moscow and Nanking, and war clouds for a while darkened the international horizon. Both countries, however, proclaimed their allegiance to the Kellogg peace pact; though large forces were assembled on the frontiers and there were some serious clashes of arms, the danger of war appeared to be averted late in the year, but the matter of railway control was still unsettled.

TRANSUBSTANTIATION, *tran sub stan'-shih a' shun*, a theological doctrine expressed in a canon of the Council of Trent (which see), and which represents the belief of the Roman Catholic Church at the present time. It is expressed as follows:

If anyone shall say that, in the most holy sacrament of the Eucharist, there remain the substances of bread and wine together with the body and blood of our Lord Jesus Christ; and shall deny that wonderful and singular conversion of the whole substance of the bread into His body and of the wine into His blood, the species only of bread and wine remaining—which conversion the Catholic Church most fittingly calls *Transubstantiation*—let him be anathema.

According to an eminent Church authority, in the definition above, the word *substance* means *reality*, and the word *species* is used for *outward appearance*.

TRANSVAAL, *trans vahl'*, THE, one of the four original provinces in the Union of South

Africa (which see). See, also, SOUTH AFRICAN WAR.

TRANSYLVANIA. See RUMANIA (Historic Provinces).

TRANSYLVANIA COMPANY. See KENTUCKY (History).

TRAPDOOR SPIDER, an interesting spider found in warm regions, which constructs a hinged door of silk and earth to cover the round entrance to its underground nest. This door, made of alternate layers of silk and mud, fits the entrance perfectly, and is hinged at one side to the silk lining of the burrow. In loosening and carrying away earth, and in



TRAPDOOR SPIDER AND ITS NEST

spinning silk to make the door and lining, the spider works long and laboriously. Tunnels almost an inch across and a foot long are dug by a species found in the southwestern part of the United States. When in danger, the spider flees into the tunnel and clings to the door with its jaws. The burrow is also a place of refuge for the mother spider when rearing her young. As a measure of precaution, the entrance is concealed by a covering of earth or gravel. These spiders are large, hairy creatures, belonging to the tarantula family. They feed principally on ants and other wingless insects, and sometimes on caterpillars and earthworms. S.H.S.

Scientific Name. Trapdoor spiders belong to the family *Theraphosidae*, of the class *Arachnida*. The species common in the Southwestern United States is *Ctenisza californica*.

TRAPEZIUM, *tra peez' ih um*, as usually defined, a plane figure having four sides, none of which are parallel. See QUADRILATERAL (Trapezoid and Trapezium); MENSURATION.

TRAPEZOID. See QUADRILATERAL (Trapezoid and Trapezium); MENSURATION.

TRAPPISTS, *trap' ists*, a branch of the Cistercian monks, famed for the austerity of its rules. These were introduced in 1664 by the abbot of La Trappe, a Cistercian monastery founded in Normandy, France, in 1140. The order was driven out of France during the Revolution, but returned about 1817. At the time of the expulsions of 1903, in France, there were fifty-eight Trappist monasteries in that

country. At the present time, the Trappist monasteries are scattered throughout Europe, Asia, Africa, the United States, Canada, and China.

A member of the Trappists gives most of his time to prayer and meditation; the fast rule is severe, and meat, eggs, fish, wine, and beer are absolutely forbidden. Strict silence is observed among the monks, and only the abbot and the guest-master are allowed to speak to strangers. The bed consists of a board and a pillow of straw, and the garments are not removed at night. Several hours daily are devoted to hard labor. In heathen countries, the work of the order is directed to the civilization and education of the natives.

TRAPS AND TRAPPING. See **FUR AND FUR TRADE** (Fur Conservation).

TRAUMATIC IRITIS, *traw mat' ik i ri' tis*. See **BLINDNESS** (Common Eye Diseases).

TRAVELER, Lee's horse. See **LEE**, ROBERT E.

TRAVELERS' CHECK. See **CREDIT**, LETTER OF.

TRAVERSE, LAKE. See **SOUTH DAKOTA** (Rivers and Lakes).

TRAVERSE CITY, MICH. See **MICHIGAN** (back of map).

TRAVERTINE, *trav' ur tin*, is a white or straw-colored porous stone, formed from the lime deposits of streams, lakes, and springs. It is a soft and spongy rock, easily worked when first quarried, but hardening afterward. Large deposits are found in many parts of Italy. It is the material that was used for the outside walls of numerous buildings of ancient and modern Rome, including Saint Peter's and the Colosseum. Among the ancient Romans, it was known as the stone of Tibur (*lapis tiburtinus*), because it was formed by the waters of the Anio at Tibur, an ancient Latin town, now Tivoli. It cannot be used as a building material in countries where the temperature falls below the freezing point, for the rock is so porous that it absorbs much water, which would expand on freezing and cause the rock to disintegrate. A.J.

TRAVIATA, LA, *trah ve ah' lah, lah*. See **OPERA** (Some of the Famous Operas).

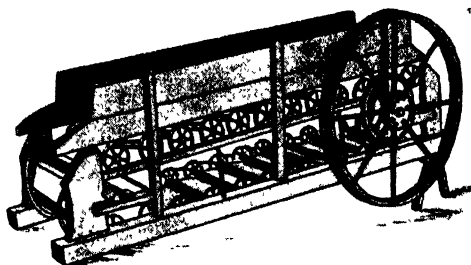
TRAVIS, WILLIAM BARRETT. See **ALAMO**.

TRAWL. See **NET**.

TREACLE, *tre' k'l*, **BIBLE.** See **BIBLE** (Famous Versions of the Bible).

TREADMILL, *ted' mil*, a machine formerly used in prisons, in some countries, where it was operated by convicts sentenced to hard labor. It consisted of a large, wide, and heavy revolving wheel with steps around the circumference and a handrail above. When the criminals were placed on the steps, the weight of the men started the wheel to revolving. To keep their balance, they were forced to grasp the rail and tread the mill so long as the

machine was in motion. The power produced could be used for grinding corn or for other similar purposes. Operation of the machine was considered a form of cruelty, and its use as a punishment has been abandoned. When



OLD FORM OF TREADMILL

introduced in England, in 1818, it was intended as a means of employing criminals usefully.

The name is still applied to a machine in which use is made of the weight of dogs or horses on a series of treads, for industrial purposes.

As a Figure of Speech. The word is used in literature, in a figurative sense, to signify ceaseless toil.

TREASON, *tre' z'n*, in a broad sense, is treachery, breach of faith, or the betrayal of any trust. In its legal application, it is a serious breach of allegiance to a government, committed by a citizen or subject, or by one under its protection; as such, it is the greatest crime known to the law, as attacking the safety of a sovereign state or its head. While murder is a grave offense, its results directly affect but few people; treason, if its object be accomplished, may destroy the peace of a nation and work harm to all of its citizens. Possibly as comprehensive a definition of treason as can be given is found in the United States Constitution, Art. III, Sec. 3, and it is the only crime defined in that document. With the change of a few words, it will apply to any country:

Treason against the United States shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort.

The present law of treason, both in England and in the United States, is based upon the Treason Act of England, passed in 1351, during the reign of Edward III. This act follows the principle of the old Roman law of 48 B.C. Before the Norman Conquest, the laws of Alfred and of Ethelred punished with death anyone plotting against the life of the king.

The possibility of committing treason is not limited to citizens or subjects of a country. An alien within its boundaries owes temporary allegiance to the government which shelters him, and he is bound to observe all the laws which control its citizens; the alien who gives

aid or comfort to the country's enemies is guilty of treason, and against such a charge his own country cannot protect him. To incur punishment for treason, there must be conviction of the crime through Federal courts; or, in time of war, when the writ of habeas corpus is suspended, through trial by court-martial, according to common-law procedure.

In cases of treason against the United States, Congress has power to decide what the punishment shall be, the only provision of the Constitution being that it "shall not work corruption of blood, or forfeiture, except during the life of the person attainted." (*Corruption of blood*, under the common law, deprives one convicted of treason of his estate, and his heirs of their inheritance.) Death or life imprisonment is the usual penalty of the law.

The most notable charges of treason against the government of the United States are those of Benedict Arnold and Aaron Burr; the latter was declared not guilty. The Dreyfus Case in France is the best-known instance of a charge of treason in recent times, but Captain Dreyfus later proved his innocence, and received promotion.

Related Subjects. The following articles in these volumes will serve to make clear the references in the foregoing discussion of treason

Alien	Burr, Aaron	Crime
Arnold, Benedict	Court-Martial	Dreyfus, Alfred

TREASURER OF THE UNITED STATES.

See **TREASURY DEPARTMENT.**

TREASURE STATE, a popular name applied to Montana (which see).

TREASURY DEPARTMENT, the executive department of the United States government which has control of the nation's financial affairs. The Treasury Department collects all taxes levied by Congress, including customs duties, income taxes, and internal-revenue fees, and it also disburses all moneys collected. It has direct management of the minting of coins, as well as the printing of paper money and postage and other stamps. It protects the people from counterfeiters, and maintains a fleet of small, armed vessels to prevent smuggling and violation of quarantine laws. The construction and maintenance of all United States government buildings throughout the country are part of its work, and the auditing and general control of the financial accounts of the other executive departments are a part of its duties. The life-saving system (Coast Guard), Secret Service, enforcement of prohibition, and coast survey are all managed by the Treasury Department. With the exception of its duties as financial agent for the government, perhaps the Department's chief responsibility is the supervision of the national banks.

The head of the Department is the Secretary of the Treasury, who is appointed by the President, with the approval of the Senate,

and is a member of the Cabinet. The Secretary receives a salary of \$15,000 a year, and is next to the Secretary of State in the line of succession to the Presidency. He shares his duties with an Undersecretary, who is paid \$10,000 a year, and three Assistant Secretaries, whose salaries are \$9,000 a year. Many of the most famous Americans have held this important position, including Alexander Hamilton, Albert Gallatin, William H. Crawford, Roger B. Taney, Salmon P. Chase, and John Sherman. The details of management are divided among a number of officials and bureaus, the most important of which are listed below:

The Comptroller of the Currency (\$5,000 a year and \$7,000 additional as member of the Federal Reserve Board) is one of the most important of the Treasury officials. The chief of the division of bookkeeping and warrants (\$6,000 a year) has general supervision over the auditors, and he also countersigns warrants (orders to pay) and other documents. The six auditors are assigned, respectively, to the Treasury, War, Navy, Interior, Postoffice, and the State and other departments. They examine and approve all accounts for their departments. The Treasurer of the United States (\$8,000 a year) signs all the paper money issued by the government, and is the official directly responsible for the care and disbursement of all money belonging to the United States. The Register (\$6,000 a year) signs in facsimile all United States bonds and, with the Treasurer of the United States, all paper money issued by the national government.

The Commissioner of Internal Revenue (\$10,000 a year) enforces the internal-revenue laws and collects all internal taxes and fees, including income taxes. There is a collector of internal revenue for each of the many districts into which the country is divided. For the collection of customs duties, there are collectors in each district, all responsible to the bureau at Washington. The Secret Service branch of the department tries to prevent smuggling, counterfeiting, making whisky in secret ("moonshining"), and other violations of revenue laws; and members of the Service invariably are assigned to guard the President when he appears in public. The Director of the Mint (\$6,500 a year) has charge of the coinage at the various mints, and the Solicitor of the Treasury (\$8,500 a year) is the legal adviser of the Department. The Prohibition Commissioner (\$9,000 a year) is charged with enforcement of the Eighteenth Amendment. The Director of the Budget (\$10,000 a year) prepares the annual budget. There are many other bureau heads of minor importance. The Bureau of Printing and Engraving, established in 1874, prepares the designs and prints postage and revenue stamps, government bonds, Treasury drafts, and paper currency. It is



Photo: U & U

PRICELESS TREATIES CAREFULLY GUARDED

In steel vaults, fireproof and dustproof, in the Department of State at Washington, are stored the treaties that record the agreements mutually entered into between the United States and foreign governments. In the illustration, the custodian is examining the treaty that conceded the independence of the American nation; it was signed on behalf of England by King George III.

under the charge of a director, who receives \$8,500 per annum.

Related Subjects. The following articles in these volumes will explain the references in this discussion of the Treasury Department:

Assaying (Assay Office)	Internal Revenue
Banks and Banking	Mint
(Banking in the	Money
United States)	Presidential Succession
Budget	Act
Coast Guard	Secret Service
Counterfeiting	Smuggling
Customs Duties	Tax and Taxes
Hamilton, Alexander	Van Buren, Martin

TREASURY NOTES. See MONEY (Monetary System of the United States).

TREASURY STOCK. See BOOKKEEPING (Opening Corporation Books).

TREATY, a formal agreement, usually but not necessarily in writing, between two or more governments or rulers of independent states, corresponding, in a general way, to contracts between private parties. Only sovereign states can make treaties, and the negotiation of a treaty is a mutual recognition of independence and sovereignty. A *concordat*, an agreement to which the Pope is a party, is not a treaty, nor is a *convention* between a sovereign state

and an individual. An agreement between two kings on a private matter is not a treaty. Unlike a private contract, a treaty is not void because it is made under duress, that is, if one of the parties uses force. The cession of a province, after the enemy has taken it by force of arms, is incontestable, except again by force of arms. Also, unlike a private contract, a treaty does not go into effect until it is *ratified*; for example, if the United States ambassador negotiates a treaty with Great Britain, the treaty does not become effective until it has been approved by the United States Senate and by the British king.

Kinds of Treaties. Treaties may be divided into several classes, according to their purposes. The following divisions are arbitrary, and a treaty may frequently include clauses under several classes:

(1) *Political*, such as treaties of peace concluding a war, treaties of defensive or offensive alliance, agreements for cessions of territory, or for arbitration of disputes. Agreements for the exchange of prisoners, for truces, or the surrender of an army are wrongly called treaties; but an agreement finally ending a war is rightly a treaty. In this connection, reference is often made to the *status quo*, a Latin

phrase which literally means the *state in which*. Thus, if a treaty is said to leave things *in status quo*, the expression means that things are left as they were, or in the *state in which* they had been.

(2) *Commercial*, including agreements referring to customs tariffs, navigation, fisheries, and consular service.

(3) *Confederations*, such as the Zollverein, the Latin monetary union, and the International Postal Union.

(4) Agreements relating to the extradition of criminals.

(5) Civil justice, relating to the protection of trade-marks, copyrights, and patents in foreign countries, and the rights of alien residents of a country.

Negotiations. In monarchies, the treaty-making power is usually vested in the Crown, which may conduct negotiations through an envoy specially appointed, or through the ordinary diplomatic representatives (see DIPLOMACY).

In Great Britain, neither house of Parliament has any power over treaties. Canada has won for itself the right to negotiate commercial treaties, but in political matters it is bound by the British treaties; commercial agreements are made by the Governor-General and his Privy Council, and must be ratified by the Dominion Parliament. In republics, the chief executive usually possesses the power to make treaties. In France, the approval of both chambers of the National Assembly is necessary if the treaty involves the appropriation of money or in any way affects commercial relations.

In the United States, the Constitution (Art. II, Sec. 2) grants to the President the "power, by and with the advice and consent of the Senate, to make treaties, provided two-thirds of the Senators present concur." The separate states are forbidden to enter into treaty agreements with foreign countries, or even with each other. Actual treaty negotiations are in the hands of the Department of State, sometimes through special envoys, but more often through the ambassadors or ministers abroad. In practice, the Senate has almost never been asked for "advice"; its share in the making of treaties is confined to the "consent," which is not always forthcoming, in which case the treaty fails.

Language Used. Until the eighteenth century, almost all treaties were written in Latin, which was the official or diplomatic language of Europe. Even treaties between states having a common language were usually in that language. In recent times, French is frequently employed in making treaties, but it has also become customary to write them in the languages of the treaty-making nations.

Enforcement of Treaties. It was formerly the practice of all nations to give hostages for the performance of treaty obligations. The ancient Egyptians, the Hebrews, the Greeks,

and the Romans followed this custom, which has been abandoned in modern times. The last example of this practice occurred in 1748, when two British peers were sent to France as hostages to insure the return of Cape Breton Island (Nova Scotia) to France. The hostage was practically a prisoner of war; if the treaty was not carried out, he was punished, even to death. Since the eighteenth century, the fulfillment of a treaty rests on the good faith of the nations who are a party to it, although it must be admitted that a powerful army or navy has sometimes been a threat to secure treaty rights. A nation injured by the failure of another nation to carry out a treaty has had no recourse except in war. When, in 1914, the World War engulfed Europe, there was much discussion in Germanic circles to the effect that a treaty is only "a scrap of paper." If such a thought dominates those who control the destinies of nations, and other powers remain quiet when treaty rights are violated, then a treaty is only binding in "political fair weather," and all nations must be ready to fight to uphold their rights. Since the war, the world has developed a spirit which demands that all strong nations unite to force respect for treaty obligations. This is one of the objects of the League of Nations. The Kellogg pact for the renunciation of war promises to attain the same object.

Termination. A treaty may be terminated in various ways. It may be *abrogated* (literally, "called off") by mutual agreement, or it may contain a clause giving either party the right to cancel it after due notice. If one of the parties disregards its provisions, the other may *denounce* it, and refuse to be bound by it. If the conditions become physically impossible of fulfillment, the treaty is void. If we suppose, for example, that the straits of the Dardanelles by treaty are opened (as is the case) to the ships of all nations on equal terms, the treaty will be valueless in case the Dardanelles should become unnavigable. In case of war, most treaties are merely *suspended*, or temporarily not in effect, but commercial treaties, in such circumstances, are void, and must be renewed after the war.

Ecclesiastical Treaties. These are not treaties between ecclesiastical authorities, but treaties entered into by sovereign states and bearing upon the right of citizens or subjects of one state to the exercise of their religion within the boundaries of another. Among the Western nations, where freedom of worship prevails, no difficulties exist; a man may practice his religion as freely in a foreign land as in his own. But the question has arisen frequently in connection with missionary enterprises—indeed, missionary work cannot be carried on successfully in any pagan country which refuses to make ecclesiastical treaties.

In China, in Japan, and in various other countries, Christian missionaries are allowed by treaty to teach the principles of Christianity, if they do so peaceably; in some countries, on the other hand, foreign residents are permitted to practice their religion unmolested, but are forbidden to try to secure converts to their faith.

E.D.F.

Related Subjects. The principal treaties among nations are listed in these volumes under their respective headings. The reader is also referred to articles on the following treaties or agreements made by the United States with foreign powers:

Armaments, Limitation of
Clayton-Bulwer Treaty
Four-Power Agreement
Guadalupe Hidalgo, Treaty of
Hay-Pauncefote Treaty
Jay Treaty
Louisiana Purchase
Paris, Treaties of
Renunciation of War

Treaty with China (see
BURLINGAME, ANSON)
Treaty with Panama (see
PANAMA (History))
Treaty with Spain (see
FLORIDA (History))
Washington, Treaty of
Webster-Ashburton
Treaty

TREATY FOR RENUNCIATION OF WAR, GENERAL. See RENUNCIATION OF WAR, GENERAL TREATY FOR.

TREATY PORTS, a number of port cities in China through which commerce is carried on with foreign countries, under treaty provisions.

Prior to 1842, trade with China was conducted without government permission or protection. In that year, a treaty was entered into by Great Britain and China, providing that five ports, Canton, Amoy, Fu-chau, Ningpo and Shanghai, should be open to foreign trade. Since that time, similar treaties

have been made with other nations, and to-day there are about forty-five treaty ports and a number of commercial ports in China. Most of these agreements have been obtained from China, as concessions following wars or other disagreements with various powers.

Under the existing arrangements, trade with China has shown a steady increase each year. The net imports average over a billion dollars annually, and the exports are about four-fifths of that amount.

The goods imported consist chiefly of cotton, metals, tobacco, foodstuffs, fishery products, chemicals, coal, machinery, vehicles, and kerosene. The principal exports are silk, cereals, cotton, tea, and animal foodstuffs.

The major part of this trade is carried on with Great Britain, Germany, France, Japan, the United States, India, and Russia. See CHINA (Commerce and Transportation).

TREATY TO OUTLAW WAR. See the article RENUNCIATION OF WAR, GENERAL TREATY FOR.

TREBIZOND, *treb' ih zond.* See TURKEY (The Cities).

TREBLE, *treb' 'l,* the highest of the parts in harmonized music, such as are sung by women or boys, or played by instruments like the violin, flute, clarinet, and oboe, or played on the higher keys of the piano or organ. *Treble clef* is the term applied to the character used in

designating the treble staff. For illustration and description, see MUSIC (A Lesson on the Staff).



The STORY of TREES

TREE. "The groves were God's first temples," and in the presence of the trees one finds peace, quietude, and inspiration. Although trees benefit us in a multitude of practical ways, providing shade, clothing, shelter, and food, we never lose the feeling that they are the noblest members of the plant world. The majesty of straight-columned, tall-growing trees furnished the inspiration for the Gothic cathedrals of Europe, those impressive churches whose vaulted arches seem to lose themselves in the very heavens. And so in the presence of beautiful trees, man realizes his limitations and says with the poet Joyce Kilmer:

I think that I shall never see
A poem lovely as a tree.

A tree whose hungry mouth is pressed
Against the earth's sweet flowing breast.

A tree that looks at God all day
And lifts her leafy arms to pray;

A tree that may in summer wear
A nest of robins in her hair;

Upon whose bosom snow has lain;
Who intimately lives with rain.

Poems are made by fools like me,
But only God can make a tree.

A Tree and Its Parts. The thick, woody, self-supporting stem of a tree differentiates it

from other kinds of plants. Shrubs, it is true, have woody stems, but shrubs usually send up several stems from a main root, and most trees



send up but one, which we call the trunk. Trees are also larger than shrubs, though it is difficult to say exactly how tall a shrub must be to be called a shrub and not a tree. Some authorities make ten feet the limit. Trees are perennials, and live on from year to year, indefinitely. The great trees of the *Sequoia* genus, in California, are the oldest living objects in the world. Some of

them are thousands of years old and still in vigorous condition (see subhead, below).

Besides the trunk, or bole, the principal

parts of a tree are the roots and the crown. The roots extend downward deep into the earth. They supply the tree with water and the plant food taken from the soil, and hold it firmly in position. The root systems of trees vary with the size and shape of the crown. A tree having a large, spreading crown, such as the elm, for instance, has a larger root system than one whose crown is cone-shaped, like that of the pine or fir. The root system of a tree with a large



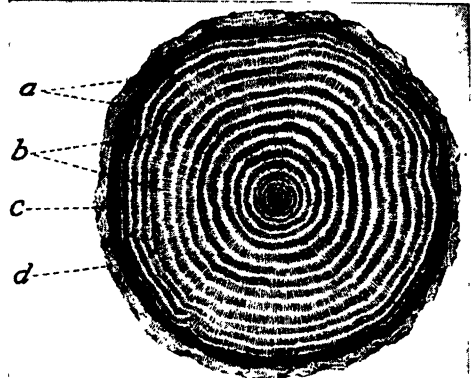
FIG. 2

Tree with divided bole

crown is subjected to an enormous strain in case of a strong wind, and it must be large enough to keep the tree from being blown down.

Trees are divided into two general classes, according to the plan of the bole. In those of

the first class, the bole extends the entire length of the tree without division. Examples are the pine, fir, and hemlock, among the evergreens; and the beech, among deciduous trees (that is, those that shed their leaves in the fall). This plan is shown in Fig. 1. In trees of the other plan, the bole divides into branches, forming a large crown, as seen in the elm, oak, and maple. This is shown in Fig. 2. The shape of the crown depends upon the plan of the bole. Trees of the first plan are nearly always conical when allowed to grow unhindered, but in pine forests the trees are so close together that the



AGE OF A TREE

Cross section of a tree showing rings of annual growth:

- | | |
|------------------------------|------------------------------|
| (a) Rings of annual growth | (c) Interior layer of bark |
| (b) Boundaries between rings | (d) Hard plates of dead bark |

lower branches die, leaving a long, naked trunk which bears a few branches at the top. In cool climates, the elms furnish the best examples of the branching bole, because the crown is usually symmetrical and graceful.

How to Study Trees. One need not be a scientist to know something about trees, and their study affords much pleasure. In the first place, begin with the trees in your locality. Select one tree, and study it through the year. The time for beginning this study is not especially important, provided you continue your observations to the same date in the following year, but your observations should be directed to the feature that is the most prominent at the time. If the tree is in blossom when it first interests you, study the blossoms; if the leaves have fully developed, study them. Should the observations begin in the winter, study the bole, branches, and bark. The flowers and fruits are of special interest. Do the flowers appear before the leaves? Are they large and showy, or small and apparently insignificant? How does the tree scatter its seeds? Are the seeds enclosed in a bur? Are the seeds of value to man? If so, for what are they used? Study the wood. Provided you can do so without

injuring the tree, procure specimens. Can you tell the different kinds of lumber by the grain, as pine from spruce, and oak from beech and maple? Small pieces of boards that will enable you to make this study can easily be obtained at carpenter shops.

The Age of Trees. Each year the hardwood or the softwood tree records its age by adding a layer of new wood to its bole and branches. When the bole of one of these trees is cut across and the surface made smooth, these rings can be counted, so that it is easier for us to determine the age of a tree than that of any other thing that has a long life. Many trees are living witnesses of a distant past, and have recorded in their boles events that took place about them. The average life of nearly all classes of trees is more than a hundred years, and many live several centuries. Though the tree grows as long as it lives, it grows more slowly after reaching maturity. The oak, for example, reaches maturity in 120 to 200 years; after that, the annual layers of wood are very thin. The oak is said to live a thousand years. As Dryden expresses it:

Three centuries he grows and three he stays
Supreme in state; and in three more decays.

The Charter Oak must have stood several centuries when, in 1687, the charter of Connecticut was concealed within it. This tree was blown over in 1856. The Washington Elm was an old tree when Washington, in 1775, took command of the American army under its protecting shade; it stood until 1923. Many of the great trees in the region of the Rocky and Cascade mountains are from 800 to 1,000 years old. In 1900 there was felled a giant California redwood that began its existence in 271 B.C. A scientific study of the trunk of this tree revealed many interesting facts in its history.

It was 1,763 years old when Columbus discovered the New World, and some of the "big trees" are older than this (see SEQUOIA).

"Of our swift passage through the scenery
Of life and death, more durable than we,
What landmark so congenial as a tree,
Repeating its green legend every spring,

And with a yearly
ring
Recording the fair
seasons as they
flee,
Type of our brief
but still renewed
mortality?"



DIAGRAM OF ROOTS AND CELLS

(a) Cortex, the outer bark. (b) Cambium, soft tissue. (c) Woody fiber. (d) Dotted ducts. (e) Pith. (f) Root hairs.

Trees are subject, like other plants, to the attacks of insects and to the effects of fungi and bacteria. Considerable damage is done to standing timber by wood-rotting fungi, some of which cause young wood and bark to decay, and some of which affect the heartwood. When trees are exposed to plant enemies of this nature, they may not live their allotted number of years. See FUNGI.

Planting Trees.

The following suggestions will be found helpful to those who have

not had experience in planting trees:

1. See that the soil is suited to the tree. Trees often die because they are taken from a locality having a different soil from that to which they are transplanted. Fall is a good time in which to plant young trees.
2. Make the hole large enough to spread the roots out in their natural position. Make it so deep that the tree will be about three inches lower in the ground than it was in its former position.
3. Have the soil finely pulverized and moist, but not wet. Work the soil around the rootlets with the hand; so that all the rootlets will come in contact with it. Fill the hole with earth, shaking it in loosely, and then tramp in firmly with the feet.
4. After filling the hole, drive three stakes firmly into the ground about a foot from the tree. Wind a piece of cloth around the tree on a level with the top of the stakes, and brace the tree firmly by winding a strong cord around it and tying this to each stake.

5. Cut off the ends of the branches and of the trunk, to prevent growth the first year.

6. Keep the soil moist throughout the season, but do not use so much water as to make it muddy, since this will "drown the roots." G.M.S.

Related Subjects. The following general articles and descriptions of trees will be of interest in connection with this discussion of trees:

Acacia	Judas Tree
Ailanthus	Juniper
Alder	Laburnum
Arbor Vitae	Lancewood
Ash	Larch
Aspen	Laurel
Balm of Gilead	Leaves
Balsa	Lignum-Vitae
Banyan	Linden
Basswood	Locust
Bay Tree	Lumber
Beech	Mahogany
Birch	Mangrove
Bird's-Eye Maple	Maple
Botany	Mountain Ash
Bottle-Tree	Mulberry
Box-Elder	Nettle Tree
Box Tree	Nut (with list)
Cabbage Palm	Oak
Cacao	Osage Orange
Cannon-Ball Tree	Palm
Catalpa	Palmetto
Cedar	Palmyra Palm
Cocoa (The Tree)	Pepperidge
Cone-Bearing Trees	Pepper Tree
Cork	Pimento
Cottonwood	Pine
Cypress	Plant
Date and the Date	Poplar
Palm	Prickly Ash
Deciduous Trees	Roots
Dogwood	Rosewood
Doom Palm	Sandalwood
Ebony	Sassafras
Elm	Seeds
Eucalyptus	Sequoia
Evergreen	Shrub
Fir	Sorrel Tree
Forests and Forestry	Spruce
Fringe Tree	Stem
Fruit (with list)	Sycamore
Ginkgo	Tallow Tree
Hawthorn	Tamarack
Hemlock	Tamarind
Holly	Teak
Honey Locust	Tulip Tree
Horse-Chestnut	Upas
Ironwood	Willow
Ivory Palm	Yew

TREE, SIR HERBERT BEERBOHM (1853-1917), an English actor and theatrical manager, widely known for his productions of Shakespearean plays. In most of these, he himself played leading rôles. He was born in London, where his father, Julius Beerbohm, was in the merchandise business. Young Herbert made his first professional appearance on the London stage in Boucicault's *Grimaldi*, in 1876, and about that time added Tree to his original name, for use on the stage. For several years he attracted no special attention, but in 1884 suddenly gained international fame by his impersonation of the Rev. Robert Spalding in *The Private Secretary*. His accurate imitation of the typical English clergyman became

the talk of London theatergoers, and his services were at once in demand by numerous managers, not only in England but in America, as well.

During the next three years, he created the leading rôles in Hugh Conway's *Called Back* and Sir Charles Young's *Jim the Penman*. He then became his own manager, took charge of the Comedy Theater in London in 1887, and immediately made a great success of Tristram's drama, *The Red Lamp*. Within a few months he assumed management of the famous Haymarket Theater in London, and for many years played to crowded houses.

Tree took charge of Her Majesty's Theater in London in 1897, opening it with *The Seats of the Mighty*. He produced new plays with a versatility which astonished dramatic students, and which, after the death of Sir Henry Irving in 1905, secured for him the rank of the greatest living British actor. His interest in the stage and its people inspired him to open a school of dramatic art, for young actors, in 1907, and in 1909 he was created a knight by King Edward VII. In 1916 Sir Herbert made a successful tour of the United States, appearing in *Henry VIII* and *The Merchant of Venice*, and in a successful revival of Du Maurier's *Trilby*.

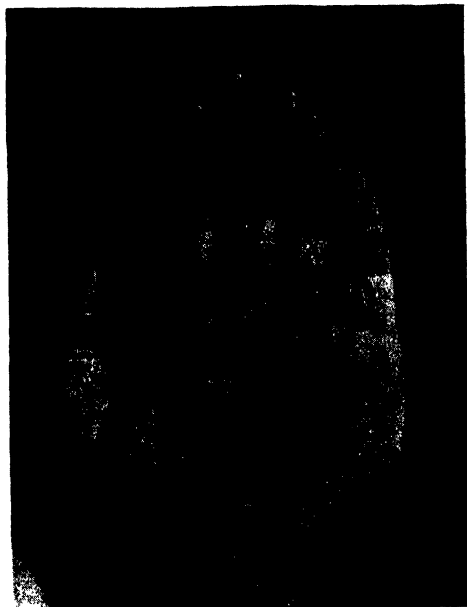


Photo: U & U

SMALL FROG WITH A POWERFUL THROAT

This tiny tree frog, it is claimed, can be heard a mile when weather conditions are favorable, but this statement is open to grave doubt.

TREE FROG, OR TREE TOAD, a small tree-dwelling frog. The toes of tree frogs have soft pads on the tips, which act like suckers

and help these creatures to cling to smooth bark. Most of the tree frogs have the power to change color through a range of grayish-browns and greens, according to the color of their surroundings. Like all other frogs, they are harmless, and extremely useful as destroyers of insects. Their breeding habits are various and interesting. In Brazil there is a species in which the female deposits the eggs in a round mud nest, constructed on the bottom of a pond. The females of other South American species have pouches in which the eggs are placed and the tadpoles develop. Some species place the eggs on trees above pools, and the tadpoles, when hatched, slip down into the water.

M.J.H.

TREE OF HEAVEN, another name for *ailanthus* (which see).

TREE OF LIFE. See *ARBOR VITAE*.

TREE OF THE UNIVERSE. See *YGGDRASIL*.

TREE-PLANTER STATE. See *NEBRASKA*.

TREE TOAD. See *TREE FROG*.

TREFOIL, meaning *three-leaved*, is the name applied generally to various plants having compound leaves in three parts, like the clover. It is specifically applied to the *Lotus* group, a genus belonging to the legume family. Several species of this group are found in the temperate parts of the northern hemisphere.

Bird's-foot trefoil, so called because it bears clusters of pods somewhat resembling a crow's foot, has prostrate stems, yellow flowers with a honey-like scent, and leaves divided into three leaflets. The plant is sometimes identified with the Irish shamrock. It grows commonly in European meadows and in the United States, especially in the South. Among other species are the *winged pea*, which southern Europeans use in making salads; and *marsh bird's-foot*, common in damp meadow land. In art, *trefoil* is the name of a three-lobed decorative figure.

B.M.D.

Scientific Names. The trefoils belong to the family *Leguminosae*. Bird's-foot trefoil is *Lotus corniculatus*; the winged pea, *L. tetragonolobus*; marsh bird's-foot, *L. uliginosus*.

TREK, THE GREAT. See *UNION OF SOUTH AFRICA*; *CAPE TOWN*.

TREKBOK. See *SPRINGBOK*.

TREMBLING POPLAR. See *ASPEN*.

TRENCH WARFARE. See *WORLD WAR*.

TRENT, COUNCIL OF. After the development of the Protestant Reformation, Roman Catholic authorities felt the need of a great council for the restatement of the fundamental doctrines of the Church. From the very beginning of the Reformation, both Reformers and Catholics demanded a general council of the church. Reformers wanted all Christians to be represented, so that disputed doctrines might be discussed and ecclesiastical abuses

renounced. After many delays, a council was called at Trent, a city of the Austrian Tyrol, in December, 1545, by Pope Paul III. Wars and religious disturbances also interrupted the sittings, and the work of the Council of Trent was not completed until 1563, when its decrees were confirmed by Pope Pius IV. The result of the Council was merely a reaffirmation of Roman Catholic doctrines. It reaffirmed the doctrine of granting indulgences, but corrected some of the defects in regard to practice, and decided several other important questions. The decrees of the Council of Trent are at the present time regarded as authoritative statements of Roman Catholic creed and practice.

TRENT AFFAIR, THE, an episode of the War of Secession which is of historic importance chiefly because it involved the old question of the right of secession. In the fall of 1861, the Confederate States of America commissioned John Slidell and James M. Mason to go to France and England, to secure the aid of those countries for the Southern cause. The British mail steamer *Trent* took them aboard at Havana. On the eighth of November, the *Trent* was halted by the United States ship *San Jacinto*, under command of Captain Charles Wilkes, and the commissioners were taken prisoner and carried to Fort Warren, in Boston harbor.

Though the people of the North approved of this act, it was recognized as a breach of international law by President Lincoln and Secretary of State Seward. The President said, "We fought Great Britain in 1812 for insisting on the right to do precisely what Captain Wilkes has done." Accordingly, in response to England's demand that the commissioners be given up, the American government ordered them released and made a formal apology to Great Britain. In the course of the diplomatic correspondence, Secretary Seward congratulated England on having become an advocate of the principle to which America had long ago given assent. The commissioners proceeded to London, but accomplished nothing.

Related Subjects. The reader is referred to the following articles in these volumes:

Mason and Slidell	War of 1812
Search, Right of	War of Secession

TRENT CANAL. See *CANADA* (Transportation).

TRENTINO, *tren te' no*. See *TYROL* (Italian Tyrol).

TRENTON, BATTLE OF. See *REVOLUTIONARY WAR*.

TRENTON, N. J., the capital of the state and the county seat of Mercer County, is at the head of tidewater navigation, on the east bank of the Delaware River. It is thirty miles northeast of Philadelphia and fifty-five miles southwest of New York City. Trenton has an area of 8.5 square miles, including 266 acres

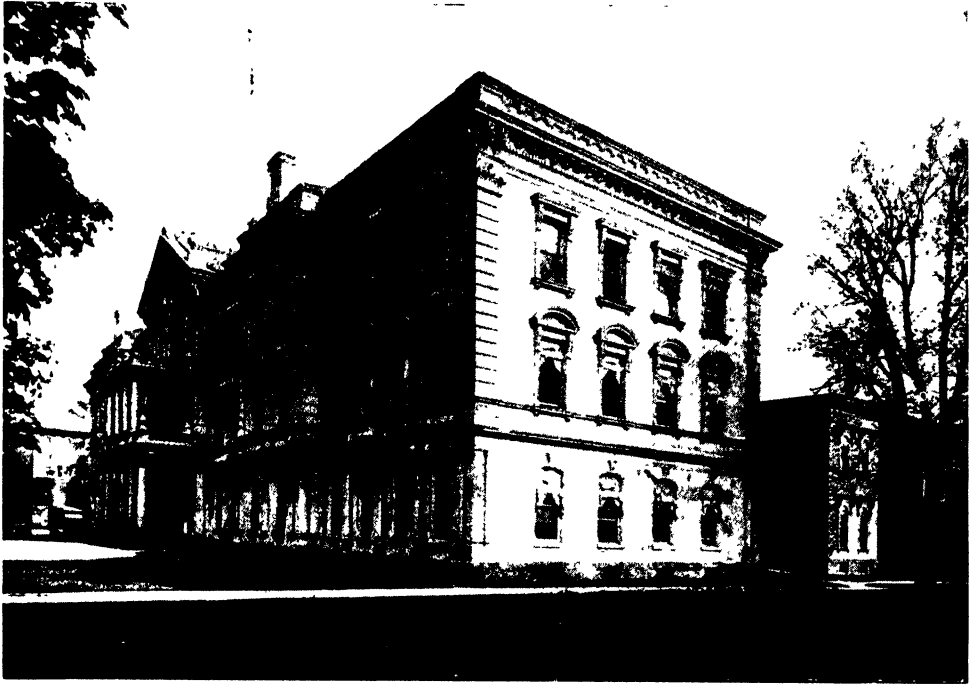


Photo: Keystone

THE STATE CAPITOL AT TRENTON

of public parks. Municipal docks, wharves, and warehouses line the water front. Population, 1928, 130,000 (Federal estimate).

Trenton has many landmarks and buildings of historical interest. In the center of the city is Battle Monument, a granite shaft 150 feet high, surmounted by a colossal statue of Washington; it marks the spot where Washington stationed his guns on the battlefield of Trenton, on December 26, 1776, after crossing the Delaware eight miles above Trenton on the previous night. The State House stands on high ground not far from the river; in Mahlon Stacy Park, adjoining the capitol grounds, are the Hessian barracks, erected by the colony in 1758 to lessen the evils of billeting, and occupied at different times by British, Hessian, and American troops during the Revolutionary War.

Transportation. The city is served by the Pennsylvania and the Reading railroads, and by four inter-urban electric lines, numerous motorbus and truck lines, and by small steamers and barges on the Delaware River and through the Delaware and Raritan Canal to the Raritan River at New Brunswick. It is on the Lincoln Highway, and has a county airport.

Industry. As an industrial city, Trenton has over 300 manufacturing establishments, including about forty potteries, and is especially noted for its clay products. All grades of pottery, from fine, decorated chinaware to the commonest varieties, are produced. White-granite sanitary earthenware, tiles, drain pipes, and porcelain bathtubs are also made. The wire mills

and iron works have an extensive output of wire cloth, netting, structural iron, anvils, cables, and chains. Trenton is also an important center of the rubber industry, and there are factories producing linoleum, school and church furniture, electrical machinery, watches, electric lamps, and candy.

Education. Trenton is situated within easy distance of numerous institutions for higher education, including Princeton University. Within the city are a state normal school, the state library, and the state school for the deaf.

Institutions. State institutions in Trenton include the home for girls, a hospital for the insane, the state prison, and the state arsenal. Outside of the city limits there is the Trenton municipal colony, with the city's institutions for the care of the sick and aged, and a city farm.

Trenton is the see of Roman Catholic and Protestant Episcopal bishops, and has 100 churches of all denominations.

History. The site of Trenton was known as a post for trade between the Indians and Dutch and Swedish colonists, as early as 1664. In 1680 Mahlon Stacy, a Quaker, made the first settlement by erecting a mill on the river bank, and the place became known as The Falls, on account of the rapids in the river, with a fall of eight feet at this point. Stacy sold his plantation in 1714 to William Trent, later chief justice of the colony, and in 1719 the name Trent-town, or Trenton, was adopted. The settlement was incorporated as a borough in 1745. A provincial congress of New Jersey met here in 1775, and in December, 1776,

Trenton was the scene of one of the important battles of the Revolutionary War, when General Washington crossed the Delaware River and took more than 1,000 prisoners. In 1783 Trenton was proposed as the seat of the Federal government, and in November, 1784, Congress met there for a brief period. It became the capital of the state of New Jersey in 1790, and in 1792 it was chartered as a city. The commission form of government was adopted in 1911.

C. OF C.

TRENT RIVER, next to the Thames and the Severn, the most important stream in England. It rises on the northwestern border of Staffordshire, and winds northeasterly through the counties of Derby, Nottingham, and Lincoln, until it meets the Ouse. These two streams unite to form the Humber. The Trent is 170 miles long, and is navigable for barges for 120 miles.

Through the Nottingham woods, watered by the Trent, Robin Hood used to roam and hunt, and on its banks is Stoke-upon-Trent, the center of a group of pottery towns which Arnold Bennett, in his novels of the "Five Towns," used for local color. See BENNETT, [ENOCH] ARNOLD.

TREPANG (the Malay *tripang*), is the commercial name for the dried bodies of certain species of marine animals commonly called *sea cucumbers* (which see). An active trade in trepang is carried on in the East Indies. Sea cucumbers have soft, wormlike bodies, varying from a few inches to two feet in length. Preparation for the market includes removal of the internal parts, boiling of the bodies, soaking them in fresh water, and smoking or drying them in the sun. The product of these processes is a rubber-like substance, which is used to thicken soups. Though it is practically tasteless, trepang is nutritious. Macassar, a seaport of Celebes, in the Dutch East Indies, is the chief center of the industry. Large quantities from that city are exported yearly to China. There is also a local trepang industry in California, conducted or encouraged by the Chinese there.

S.H.S.

TREPHINING, *tre fi' ning*, OR **TREPANNING**, *tre pan' ing*. These terms are applied to the surgical operation of making a small perforation in the skull, and they also refer to the instruments used. A trepan is a small cylinder with sharp cutting teeth on the edge. A trephine is an improved form of trepan. It has a handle placed horizontally, like that of a gimlet, and a sharp steel center pin, which projects slightly below the edge of the cylinder. The pin, when fixed on the part of the bone to be opened, forms an axis for the rotating edge of the instrument. The pin is removed when a sufficiently deep groove has been cut for the instrument to work steadily. The trepan makes complete revolutions, but the trephine

operates through semicircular movements to the right and left. Usually, a small opening less than an inch in diameter is made, and, if desired, the perforation is then enlarged with other instruments. In many cases, trephining is merely the preliminary step in operations which require the turning back of large sections of bone, as in the removal of tumor or abscess from the brain. The operation is frequently resorted to in cases of skull fracture and pressure on the brain. See SURGERY.

TRESPASS, in law, is unlawful entrance upon the property of another, or injury to the person of another. Trespass signs are seen commonly where owners of groves, private estates, and club grounds desire to protect their property from intrusion; disregard of such notices is an unlawful act. Trespass makes one liable to a civil suit for damages.

There are various other forms of trespass, such as injuring a neighbor's property by allowing cattle to get into his cornfield, throwing a stone and breaking his window, or posting a sign on his property without permission. A person who creates a disturbance in an assemblage, and refuses to leave when ordered to do so by the management, is a trespasser; he may be ejected, without return of his admission fee, and prosecuted.

Motive does not usually protect a trespasser from action against him. That is, the act of trespass may be done without malice, unintentionally, or through ignorance, but the offender is nevertheless liable to the payment of damages. On the other hand, if the offender commits an act of trespass maliciously, his motive is considered in the matter of allowing damages. False imprisonment and assault and battery are examples of trespass to the person. *Poaching* is a term for trespass upon land for the purpose of obtaining game and fish. Action for damages in cases of trespass comes under the law of torts.

Related Subjects. The reader is referred in these volumes to the following articles:

Assault and Battery False Imprisonment Tort

TRESTLE. See BRIDGE (Timber Bridges).

TREVITHICK, *trev' ih thik*, RICHARD. See LOCOMOTIVE.

TRIAD CHORD. See MUSIC (A Lesson on Harmony).

TRIAL BALANCE. See BOOKKEEPING.

TRIAL BY BATTLE. See ORDEAL AND COMBAT, TRIAL BY.

TRIANGLE, *tri' an g'l*, a plane figure having three straight sides and hence three corners, each of which is called a *vertex* (plural, *vertices*). Triangles are classified according to their sides and according to their angles. One whose three sides are equal is an *equilateral* triangle; one which has two sides equal is an *isosceles* triangle; one that has no two sides equal is a *scalene* tri-

angle. A triangle that has a right angle is a *right triangle*; one that has an obtuse angle is an *obtuse triangle*; one that has all its angles acute is an *acute triangle*. Any side of a triangle may be called the *base*. The distance from any vertex to the opposite side is called an *altitude*. In a right triangle, the side opposite the right angle is called the *hypotenuse*.

Construction of Triangles. To the young student, the construction of triangles leads to many interesting and valuable discoveries. He finds that he cannot have a triangle with any angles he chooses, but only angles whose sum is 180° ; he can have but one right angle or but one obtuse angle in a triangle; he finds that he can choose the size of two angles, providing they are not too large, but the third one is then determined for him; he finds that he can decide upon a certain number of sides and angles, and the remaining sides and angles are thereby determined. Such construction work can be done with much interest and economy in the sixth, seventh, and eighth grades. Indeed, the very keenest interest in it is found in the sixth grade. It opens the way to the more abstract demonstrative geometry of high school. The student should have a rule, a pair of compasses, and a protractor for this work. Below are a few suggestions as to problems for the student:

1. Construct a triangle with a base of 8 inches, one base angle 50° and the other 70° . Can you make the other two sides of the triangle any length you please? Can you make the third angle any size you please?

See that one side and the two adjacent angles determine the triangle.

2. Construct a triangle, one side 10 inches, another side 6 inches, and the angle included between these sides 60° . What do you find about the third side and the other two angles? Did you choose their length or size?

See here another geometric truth—two sides and the included angle determine a triangle.

3. Draw a right triangle; note the position of the sides. The longest side is opposite the right angle. Draw an obtuse triangle. Where is the longest side? In each triangle you have drawn, where is the longer side?

See that these longer sides are opposite larger angles.

4. Draw an equilateral triangle. Draw one side any length; letter the line a at one end, b at the other. Take compasses and with a as a center, and the radius ab , draw an arc; with b as a center, and the same radius, draw another arc. Letter the point where the arcs intersect c . Draw straight lines from c to a and c to b . Measure the angles of this triangle. What do you find?

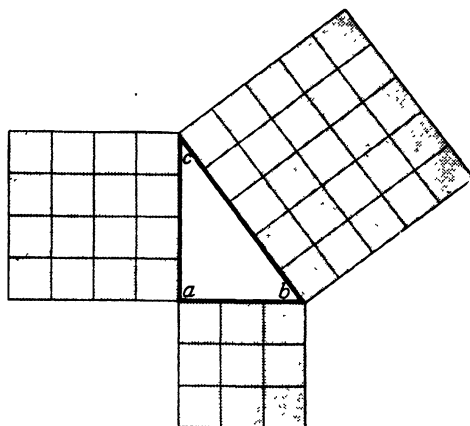
5. Repeat Problem 4, but change length of first side.

The Pythagorean Theorem. The relation of the sides of a right triangle has been known for many centuries. Pythagoras proved, about

500 B.C., that *the square on the hypotenuse of a right triangle is equal to the sum of the squares on the other two sides*.

Draw a right triangle, $a b c$, with the two perpendicular sides equal to three inches and four inches, respectively. Measure the third side, the hypotenuse.

Draw a square on the base line; draw a square on the altitude line; draw a square on the hypotenuse.



ILLUSTRATING THE PYTHAGOREAN THEOREM

How does the square on the hypotenuse compare with the other two squares?

Draw other right triangles and build squares on the sides. How does the square upon the hypotenuse compare with the other two squares in each case? The general truth is stated:

$$\text{Hypotenuse}^2 = (\text{side})^2 + (\text{other side})^2$$

$H^2 = B^2 + A^2$, if B and A represent the two perpendicular sides.

From this fact, any side of a right triangle may be found when the other two sides are known.

Problems. 1. What is the diagonal of a rectangular field 60 rods by 80 rods?

$$\begin{aligned} H^2 &= B^2 + A^2 \\ H^2 &= 60^2 + 80^2 \\ H^2 &= 3600 + 6400 \\ H^2 &= 10000 \end{aligned}$$

Note: The diagonal of the field is the hypotenuse of a right triangle.

2. A baseball diamond is 90 feet square. How far is it from first to third base? Ans. $127.27 +$ feet.

3. How far out from a wall must a $12\frac{1}{2}$ -foot ladder be placed to reach a window 10 feet from the ground?

SOLUTION

$$\begin{aligned} H^2 &= A^2 + B^2 \\ (12\frac{1}{2})^2 &= 10^2 + B^2 \\ 156.25 &= 100 + B^2 \\ B^2 &= 156.25 - 100 \\ B^2 &= 56.25 \\ B &= \sqrt{56.25} \\ B &= 7.5 \\ \text{Distance} &= 7.5 \text{ ft.} \end{aligned}$$

When the two perpendicular sides of a right triangle are 3 and 4 or 4 and 3, the hypotenuse is 5, since $3^2 + 4^2 = 5^2$. Therefore, when the two perpendicular sides are in the ratio 3:4 or 4:3, the three sides are in the ratio 3:4:5. This fact has been used as the basis for laying out "square corners." The so-called "rope-stretchers" of Egypt are said to have used it in laying out the foundations of the pyramids, and the builder to-day uses it to lay out a foundation. A line 8 feet long is stretched from the desired corner point in the direction one wall is to take; a line 6 feet long is fastened at the same point, and stretched to make a right angle with the first line; a 10-foot pole is laid from the outer extremity of the 8-foot line, extending toward the outer extremity of the 6-foot line, which is moved until the 10-foot pole just fits between the extremities of the lines. Then the corner is a right angle.

When the perpendicular sides are in the ratio 3:4 or 4:3, it is very easy to know the hypotenuse; for example:

	A	
3	4	
6	8	
21	28	35
36	48	60

Find n in each of the following.

B	A	H
15	20	n
18	24	n
n	40	50
n	27	45
27	n	45
44	n	55
51	68	n
13½	2	

Triangular Measurements. The relations among the sides and angles of triangles make up a large part of the study of trigonometry. One of the objects of trigonometry is to find heights and distances without actually measuring them, as heights of mountains, widths of bodies of water, distance of vessels out at sea, astronomical distances, etc.

Area of Triangles. (a) When a base and corresponding altitude are known, to find area, multiply base by one-half altitude. (For full discussion of this, see MENSURATION.)

(b) When sides are known, but altitude is unknown, to find area, find one-half the sum of the sides; from this subtract each side sepa-

ately. Find the product of half the sum of the sides and the three remainders found above. Take the square root of this product.

Letting s stand for half the sum of the sides, and a , b , and c for the sides, respectively, we may state the law thus:

$$\text{Area } \triangle = \sqrt{s(s-a)(s-b)(s-c)}$$

Problem. Find the area of a triangular field whose sides are 21 rods, 28 rods, and 35 rods.

SOLUTION

$$- 21 + 28 + 35 = 42$$

$$\text{Area } \triangle = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\text{Area in sq. rd.} = \sqrt{42(42-21)(42-28)(42-35)}$$

$$\text{Area in sq. rd.} = \sqrt{42 \times 21 \times 14 \times 7} = 294$$

The student will find many opportunities out-of-doors for making and testing square corners by the rope-stretcher method, and for finding the relations between the sides of the right triangle. See MENSURATION. J.W.Y.

TRIANGULATION. See GEODESY.

TRIANON, *tre ah nawN*, TREATY OF, the treaty of peace concluded between the Allies and Hungary following the World War, and signed in the gallery of the Grand Trianon at Versailles, June 4, 1920. Patterned after the Treaty of Saint Germain, which settled the issues between the Allies and Austria, the Treaty of Trianon drastically limited Hungarian territory, reduced its population more than 7,500,000, alienated about 3,000,000 Magyars (which see), and left the country landlocked and dependent upon internationalized communications. Only after bitter protest and what modifications they could obtain, would the Hungarians consent to the terms, and the day the treaty was signed, Budapest went into deep mourning.

Hungary was compelled to recognize the territorial changes already made in setting off the frontiers of Austria, Czechoslovakia, Yugoslavia, and Rumania, and to forfeit all claim to Fiume. The military and reparation clauses were similar to those in the Treaty of Saint Germain, except that Hungary was allowed an army of 35,000. All merchant ships had to be surrendered, and reparations in kind were left for special committees to decide. Except for necessary and slight variations, the financial and economic clauses were equivalent to those of the Austrian treaty. See SAINT GERMAIN, TREATY OF; HUNGARY (Boundaries and People); WORLD WAR.

TRIASSIC, *tri as' ik*, BROWNSTONE. See SANDSTONE.

TRIASSIC PERIOD, the earliest period of the Mesozoic Era, succeeding the Permian and succeeded by the Jurassic Period. It was

named from its threefold development in Germany, where it was first carefully studied. In most of North America and in parts of Western Europe, the Triassic rocks consist of conglomerate, sandstone, and shale, and are largely land or fresh-water deposits, resembling the Permian rocks. In regions where the two systems lie in conformable sequence, they are almost indistinguishable. In Southeastern Europe and Southwestern Asia, the Triassic strata, which there are largely marine limestones, reach a great thickness. In Eastern North America, the deposition of the strata was accompanied by considerable volcanic activity, especially the eruption of great sheets of lava. The cliffs of the northwestern coast of Nova Scotia, the Palisades of the Hudson, and the Watchung Mountains of New Jersey are formed by such lava sheets, which have been tilted since their eruption.

The Triassic Period was characterized by the abundance in the sea of cephalopod mollusks with coiled shells, known as ammonites, and by the dominance on land of reptiles, especially huge lizards. Remains of what may have been the earliest mammals are also found. The plant life was marked by the development of cycads and of coniferous trees. L.LaF.

Related Subjects. The reader is referred in these volumes to the following articles:

Dinosauria	Mesozoic Era
Geology	Permian Epoch
Jurassic Period	

TRIBUNE, the name given in ancient Rome to either of two officers whose functions were not in the least similar.

The Military Tribunes. These were originally the leaders of the soldiers furnished by the various tribes, and from this fact the name was taken. During the time of the republic, there were six tribunes to each legion, and they ranked next after the commander in chief. At first they were appointed by the consuls, but later part or all of them were elected by the people. Under the empire, the office declined in importance, and the tribunes came to be little more than the staff of the commander; this condition foretold their passing from the scene.

Tribunes of the People. Magistrates elected to protect the rights of the plebeians were known by this name. In 494 B.C., this class seceded from Rome and refused to return until permission was given to choose such officers [see **ROME** (Early Days of the Republic)]. At first there were probably only two tribunes, but later their number was increased to five, and at last to ten; they held office for one year only, but were eligible to reelection. The tribunes had the right to defend a plebeian against any charge; they might veto any measure proposed by the Senate; their persons were inviolable; and through these privileges they became in time the most powerful officers of the state. The gradual acquisition by the plebeians of many political rights which had originally belonged only to the patricians was largely the work of the tribunes. Augustus assumed the prerogatives of this office, and, beginning

with his reign, it lessened in importance. In the Middle Ages, Cola di Rienzi (which see), who bore this title, had a spectacular though brief career in Rome. He was made the hero of Bulwer-Lytton's novel, *The Last of the Tribunes*.

TRICEPS, *tri' seps*. See **MUSCLES**; **BICEPS**.
TRICERATOPS, *tri sehr' ah tops*. See illustration in article **DINOSAURIA**.

TRICHINA, *trih ki' nah*, an animal parasite which, when it finds lodgment in the human system, causes a serious disease known as *trichinosis*. The trichina is a minute worm which inhabits the muscles of pigs, rabbits, rats, and other animals. In these creatures, it exists as an undeveloped, hairlike organism coiled up in an enclosing sheath, or cyst, and it does not develop beyond this immature stage until it is taken into the human intestine. Human beings usually acquire trichinosis through eating uncooked or poorly cooked pork. As the meat is digested, the immature worms are freed from their cysts, and in two or three days reach maturity. About eight days later, the females, having penetrated the intestinal wall, give birth to fully developed larvae. Each worm produces from 1,000 to 1,500 of these. In countless numbers, the larvae pass through the intestinal wall and are carried by the blood vessels to the muscles, where they find lodgment. While in the muscle fibers, they increase greatly in size, and become encysted. In this form, they may remain in the muscle tissues for years. It has been estimated that, in a serious infestation, 50,000,000 larvae may enter the circulation. The muscles most heavily infested are those of the diaphragm, tongue, ribs, larynx, and eye.

Trichinosis. The first symptoms constitute the gastro-intestinal stage of the disease, when the adults and larvae are in the intestinal tract. Nausea, vomiting, and diarrhoea, with cramps, are present in severe cases. This stage of gastro-intestinal irritation develops within three days after the infested meat has been eaten. It is highly important that it be recognized, because at that time a few doses of wormseed or carbon tetrachloride, followed by a laxative, will cause the elimination of the worms. If the worms are not eliminated from the intestines, the larval forms invade the intestinal wall and migrate to the muscles, where they eventually become encysted.

Weeks after the infested meat has been eaten, trichinosis begins with a fever. This fever is sometimes suspected of being typhoid. There is headache. The soreness and aching of the muscles are so considerable as to suggest the invasion stage of smallpox. There follow some puffing of the face, and, at times, some dropsy. Diagnosis is made by examining the blood or by removing a small piece of a sore muscle and finding trichinae in it. The severity of the symptoms depends upon the number of larvae

ingested. If they are very numerous, death is probable. Otherwise, the patient may recover after the parasites become encysted. The only sure method of preventing this disease is to cook all pork and pork products thoroughly.

Encysted trichinae can be recognized in meat. Such meat is known as "measly pork." The larvae in meat do not withstand refrigeration or prolonged exposure to preservatives. Nevertheless, the injunction "Eat no raw pork or imperfectly cooked pork" is a wise one. See HOG; PARASITIC DISEASES. W.A.E.



Photo: Visual Education Service

TRICHINA SPIRALIS

Encysted in muscle; magnified 150 diameters.

TRICHOPTERA, *tri kop' tur ah*. See INSECT (Classification).

TRICLINIC, *tri klin' ik*, **SYSTEM**. See CRYSTALLIZATION.

TRICOLOR, *tri' kul ur*, a name given to the French national flag, which has three colors, blue, white, and red, in equal vertical sections, the blue nearest the flagstaff, the white next, and the red at the outer end. It was introduced during the French Revolution, and is now the sole flag of France. Other nations have adopted tricolor flags, but they do not bear the distinctive name. (See color plate, *Flags of Continental Europe*, in article FLAG.)

TRICUSPID, *tri kus' pid*, **VALVE**. See HEART.

TRIDENT. See NEPTUNE.

TRIESTE, *tre es' tay*. See ITALY (The Cities).

TRIGLYCERIDS, *tri glis' ur idz*. See BIOCHEMISTRY (Substances in Animals and Plants).

TRIGONOMETRY, *trig o nom' e trie*, a branch of mathematics having to do with the measurement of triangles and with the relations of their sides and angles to one another. It follows geometry in the regular course of study, and depends upon certain truths there demonstrated. These are as follows:

That the sum of the angles of a triangle is always equal to two right angles; and that, if three parts of a triangle, at least one of which is a side, be known, the remaining parts may be computed.

The two chief divisions of trigonometry are *plane* and *spherical*. Plane trigonometry treats of such triangles as lie wholly in a plane, and

spherical trigonometry of triangles that lie upon the surface of a sphere. To facilitate the computations to which operations in trigonometry give rise, tables of logarithms (which see) have been prepared. They were added to the science

by Napier in the seventeenth century.

The practical uses of trigonometry are many and important. Plane trigonometry, for example, is used extensively in astronomy, physics, and engineering, and spherical trigonometry is used in astronomy and in measuring long distances on the surface of the earth, where its curvature must be taken into consideration. In

surveying, the science is used in determining distances, and in measuring the height of mountains and other lofty objects. See NAPIER, JOHN. J.W.V.

TRILBY. See DU MAURIER, GEORGE LOUIS.

TRILLIUM, OR **WAKE-ROBIN**, the names of several species of plants belonging to the lily family. *Trillium*, from the Latin for *triple*, is a most appropriate name, for these plants have three sepals, three petals, two times three stamens, and three styles, and each flower blossoms from a cluster of three leaves. While *wake-robin* is a suitable name for the few species that blossom so early in the spring that they are said to be in time to "wake the robins," most of the trilliums bloom after the robins have arrived. These plants vary in attractiveness, but some of them are among our loveliest wild flowers. In general, they prefer moist woodland soil.

Earliest to bloom is the dainty *dwarf trillium*, whose solitary pure-white flower appears at the end of a stem not over six inches high. Its range is from Pennsylvania to Minnesota and south to Kentucky. The *purple-flowered* species, which follows the dwarf trillium, has a dull-colored blossom and an odor suggesting carrion. It is common in the region about Washington, D. C. Much more attractive is the *large-flowered trillium*, found from Quebec to Florida and westward. Its blossoms are white at first, but gradually change to rose. This species is commonly cultivated for the florists' trade. Among the last to blossom is the *painted trillium*, so called because its wax-white petals have stripes of wine or deep pink.



TRILLIUM, OR WAKE ROBIN

Photo: Visual Education Service

The fruit of this species is a bright-red berry. Its range is from Maine to Wisconsin, south to Georgia and Missouri, and it flowers in May and June.

Trilliums have fleshy roots which possess emetic properties. The berries of some species are thought to be poisonous.

B.M.D.

Scientific Names. Trilliums belong to the family *Liliaceae*. The dwarf trillium is *Trillium nivale*; the large-flowered, *T. grandiflorum*; the painted, *T. undulatum*.

TRIMETER, *trim' e tur*. See METER.

TRINCOMALEE, *trin ko mah le'*, a town in Ceylon (which see).

TRINIDAD, the second largest island of the British West Indies, famous as the source of most of the world's supply of asphalt. It lies six miles east of the coast of Venezuela, near the mouths of the Orinoco River. It is larger than the state of Rhode Island, for it is about 1,862 square miles in area, and, except for one projection, is very nearly rectangular. In the north and south, there are ranges of hills furrowed with many ravines and covered to the very top with dense forests. The most striking natural feature, excepting Pitch Lake, the asphalt lake, is Maracas Falls, where a river leaps in a torrent over a wall of rock 312 feet high.

Trinidad is an English crown colony, with the seat of government at Port of Spain, a fine city with a population of 65,000. The

population of the island is over 390,000. About a third of the people are East Indians, whose emigration from India has been encouraged



LOCATION MAP

The nearness of Trinidad to the mainland of South America is shown on the map in the west and in the southwest corner.

by the English government. The upper classes are creoles of British, French, and Spanish blood; the rest are negroes. English is the

language generally spoken in the towns, while in some of the agricultural districts, Spanish and French dialects predominate. Education is provided chiefly through state schools, although several religious denominations have established schools and colleges. All courses for primary schools must include agriculture, and in 1921 the Imperial College of Tropical Agriculture was instituted to train farm superintendents, planters, and specialists in the science of tropical agriculture.

In 1498, on his third voyage to the New World, Columbus vowed to name the first land he sighted for the Trinity, and in this way Trinidad was named. Spain made no attempt to colonize the island, and, except for occasional slave-hunting expeditions, the Spaniards made no use of it. England acquired the island by treaty in 1802. The natural resources have made it a valuable colony; asphalt, which for many years was the main export, has been far overshadowed by petroleum, and though the supply has only begun to be tapped, in 1928 the export of oil and benzol reached over half a billion barrels. The exportation of large quantities of tropical products assures the economic stability of Trinidad; namely, cocoa, sugar, rum, molasses, coffee, coconuts, rubber, etc. Trinidad is an important deposit market for the West Indies, and has a large carrying trade with the United States, South America, and near-by British colonies. There are telephone and telegraph communications, over 120 miles of railways, and an adequate system of roads extending about 1,700 miles. See WEST INDIES.

[The reader is referred to the article ASPHALT for a detailed description of the wonderful Pitch Lake and the asphalt industry.]

TRINIDAD, COLO. See COLORADO (back of map).

TRINITROTOLUOL, OR T.N.T. See FULMINATION; EXPLOSIVES.

TRINITY, the conception of God as one, and yet as having a threefold personality, Father, Son, and Holy Spirit. The doctrine is a development of Christian theology, not being taught in the Old Testament, but capable of being deduced from passages in the New Testament. The first authoritative statement of belief in Father, Son, and Holy Spirit was made by the earliest general council of churches, held at Nice in 325, which also declared the Son to be of equal substance with the Father. With regard to the Holy Spirit, the East and West subsequently divided, the Eastern Church holding procession of the Spirit from the Father through the Son, and the West procession alike from Father and Son. In the Protestant view, Father, Son, and Holy Spirit are equal in power and glory, each having a specific activity, the Father that of creation, the Son that of redemption, and the Spirit that of sanctification,

but the doctrine of the three in one is considered to be a mystery for which there is no adequate explanation.

TRINITY CHURCH. See NEW YORK CITY.

TRINITY COLLEGE. See VERMONT (Education).

TRINITY COLLEGE, HARTFORD. See CONNECTICUT (Education).

TRINITY SUNDAY, the Sunday after Pentecost, or *Whitsunday*, sacred to the celebration of the Trinity, and introduced into the Church calendar by Pope John XXII (1316-1334). It concludes the principal Church festivals of the year, and the succeeding Sundays till Advent are called Sundays after Trinity. The receiving of Holy Communion between the first Sunday of Lent and Trinity Sunday is obligatory on all communicants in the Roman Catholic Church.

TRIODE. See RADIO COMMUNICATION (Glossary of Radio Terms).

TRIPE, a meat consisting of part of the muscular walls of the stomach of sheep or cattle. The flesh from the first stomach is *plain tripe*; that from the folds of mucous membrane constituting the second stomach is called *honeycomb tripe*. As ordinarily prepared for market, the meat is thoroughly cleansed, soaked in limewater, partly cooked, and then pickled in vinegar. For the table, it is cut into pieces, boiled, and fried in deep fat. While it is not hard to digest, it is not a food for invalids. E.V.M'C.

TRIP HAMMER, a power hammer used principally in such forgings as do not require the heavy blows of a steam hammer (which see). It is mounted on a pivoted beam, which has an upward-and-downward motion. The hammer is raised by the action of a revolving cylinder with cams, and is released when it has reached the highest point within the range of lift of the cams, falling by its own weight. Unlike the action of the steam hammer, the stroke of the trip hammer cannot be controlled. When the hammer drops, it does so with full weight. It may, however, be released before it is raised to its extreme height, which lessens the force of the blow.

[A form of speech, commonly heard, refers to *trip-hammer blows*, meaning that the blows are delivered with every ounce of force available.]

TRIPLE ALLIANCE, a name given at various times to a union, by treaty, of three powers of Europe for stated periods of time, to assure protection for each member against outside powers, and to preserve the balance of power between European states. The first treaty of this kind was signed in 1668 by England, Holland, and Sweden, to prevent Louis XIV of France from taking possession of the Low Countries (now Holland and Belgium). Another alliance, for the purpose of checking

the power of Spain, was made in 1717 between Great Britain, France, and Holland.

The Last Triple Alliance. In 1882, Germany, Austria-Hungary, and Italy allied themselves by treaty to prevent the acquisition of territory in the Balkans by Russia, and to prevent France from declaring war upon Germany. Italy's part in this Triple Alliance was not consistent in the beginning, for Italy and Austria had never been good friends, nor had Italy ever become reconciled to the Austrian possession of the former Italian provinces, Trieste and Istria—"Unredeemed Italy." However, Italy's quarrel with France was of more recent date, for France in 1881 had taken Tunis, a territory which Italy had long coveted as a colonial possession. Furthermore, the newly united Italian state feared the Republican ideas prevalent in France, and distrusted the interest of prominent Frenchmen in restoring the Pope to his temporal authority. Then, too, France also had taken Italian provinces—Nice and Savoy. Since Italy could not hope to rescue its lost territory from Austria single-handed, especially if Germany were friendly to Austria, Italy decided, as a matter of expediency, to join Austria and Germany, rather than be left out entirely in a game for which the powers were obviously choosing sides.

The Alliance was broken by Italy in 1915, when that country not only refused to aid Austria and Germany in the World War, but declared war upon Austria in 1915 and upon Germany in 1916. Italy justified its action in this matter by pointing out that Germany first violated the terms of the Alliance by declaring war upon its enemies without consulting the Italian power at Rome. This omission of a clear obligation Italy resented, as it seemed to indicate that the Germanic powers considered the Italians a minor factor, or that Italy was not greatly above the position of a vassal nation. Moreover, the Alliance was entered into for defensive purposes; in the World War, Italy believed that Germany assumed the offensive. See **WORLD WAR**; **TRIPLE ENTENTE**.

TRIPLE DIVIDE MOUNTAIN. See **GLACIER NATIONAL PARK (Mountains)**.

TRIPLE ENTENTE, *ahn tahn't*, the French term for *triple agreement*. The outbreak of the World War in 1914 found the chief powers in Europe divided into two opposing groups—the Triple Alliance, consisting of Germany, Austria-Hungary, and Italy; and the Triple Entente, composed of England, France, and Russia. The Triple Alliance had been formed in 1882, and, to offset its influence, France and Russia had concluded a dual alliance in 1895. In 1904 England settled outstanding differences with France, and in 1907 came to an understanding with Russia about their respective policies in Persia, Afghanistan, Tibet, and other regions where their interests con-

flicted. These arrangements resulted in the formation of the Triple Entente. In the beginning, the Entente was nothing more than an informal alliance, but after the outbreak of the World War, closer consolidation was deemed necessary, and on September 5, 1914, each of the Entente powers joined the others in a definite agreement, and promised not to conclude a separate peace with the Central Powers. The Triple Alliance came to an end in 1915, when Italy declared war upon Austria-Hungary and joined the Entente Allies. The entrance of Italy into the war changed the original league into the Quadruple Entente. See **WORLD WAR**; **TRIPLE ALLIANCE**.

TRIPLET (music). See **MUSIC (Measures and Time)**.

TRIPOLI, *trip' o lih*, the former name of Libia, one of the Barbary states; also, the name of its capital. See **LIBIA**; **BARBARY STATES**.

TRIPOLI, a mineral resembling clay or chalk, composed chiefly of minute shells containing silica, which are so hard that they will scratch glass. Thick deposits of tripoli are sometimes found under peat beds. When ground to a fine powder, tripoli is used for polishing glass, metals, and marbles. It takes its name from the fact that it was originally brought from Tripoli in Africa. It is found in France, Italy, Germany, and Nova Scotia, and in several states of the American Union. See **RADIO-LARIA**; **SILICA**. A.N.W.

TRIPOLITANIA, *tre po le tah' nyah*. See **LIBIA**.

TRIREME, *tri' reem*, an ancient war vessel, or galley, invented by the Corinthians, and having three banks of oars arranged one above another. The lowest rank of rowers had the shortest oars and the easiest work. A crew might consist of 200 men, including twenty sailors, twenty marines, and the others rowers. The trireme was steered by paddles at the stern, and was provided with sails to use when not in battle. The vessel was of light draught and could easily be hauled on shore, and it was quickly and skilfully maneuvered in battle. At Salamis, the great naval battle between the Persians and Greeks, in 480 B.C., the Grecian fleet numbered more than 300 ships, nearly all triremes. See **GALLEY**, and page 7272.

Derivation. The word *trireme* is derived from the Latin *tres*, meaning *three*, and *remus*, meaning *oar*; thus, the Latin *triremis* was a galley with three banks of oars.

TRISTAN AND ISOLDE, *tris' tahn, ees-ol' deh*. See **OPERA (Some of the Famous Operas)**.

TRITON, *tri' tun*, a character in Greek mythology, son of Poseidon (Neptune) and Amphitrite, who lived with his parents in a golden palace at the bottom of the ocean. Ancient poets wrote of tritons as minor sea

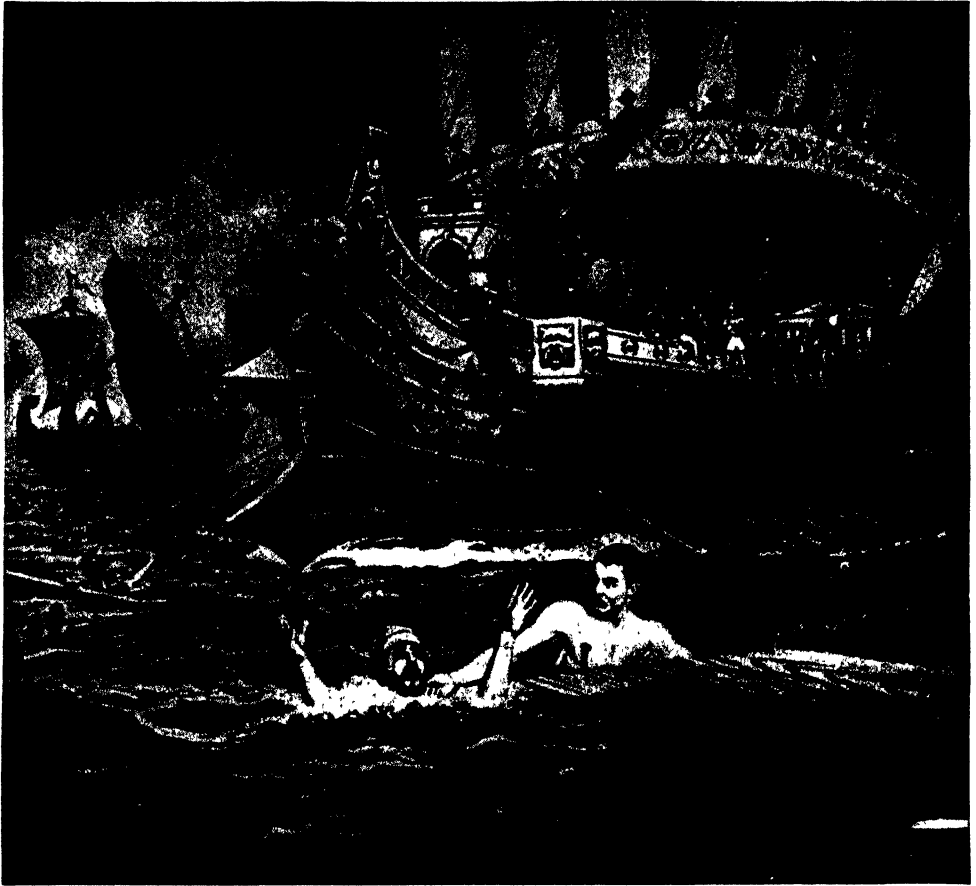


Photo: Visual Education Service

A TRIREME OF OLD ROME

A close view of one of a fleet of war ships engaged in a sea fight. Most vessels of their type were ornamented as lavishly as the one shown above. (See page 7271.)

deities with sea-green hair and eyes, human noses, broad mouths, gills below the ears, scales on their bodies, and dolphins' tails. See NEPTUNE.

TRIUMPH, *tri' umf*, a word of uncertain origin, but probably derived from the Greek *thriambos*, the name given to a procession in honor of the god Bacchus. In ancient Rome, a triumph was the highest honor that could be bestowed on a general on his return from a successful campaign. The victor entered the city of Rome in a triumphal car drawn by four horses, proceeding along the *Via Sacra* (Sacred Way) to the capitol. He was crowned with laurel and bore a scepter in his left hand, a laurel wreath in his right. The Senate, on foot, headed the procession, with the magistrates, being followed by a large body of trumpeters. A train of carriages laden with spoils of war came next. Oxen to be sacrificed to Jupiter, together with the priests of sacri-

fice, were followed by distinguished captives and inferior prisoners, the latter in chains. The victor, hero of the day, was accompanied by his children and friends, while the rear of the procession was formed by soldiery, who were given license to sing or to jest.

Under the empire, none but the emperor could be given a triumph; successful generals received rewards and decorations only, although a lesser triumph was occasionally given a great general, in which case the victor walked, and was not crowned. This celebration, called an *ovation*, from the Latin *ovis*, the name of the genus to which sheep and goats belong, concluded with the sacrifice of a sheep, instead of a bull or an ox.

A triumph given to a naval commander was very similar to that given a general, but was usually on a smaller scale, and was marked by naval display, prows of ships and other nautical trophies being borne through the streets.

TRIUMPH, ARCH OF. See **ARCH OF TRIUMPH.**

TRIUMVIRATE, *tri um' vih rate*, the term applied in Roman history to a body of three men associated in seizing the government and sharing its rule. The famous First Triumvirate, 60 B.C., composed of Caesar, Pompey, and Crassus, was the first instance of such rule, though it existed without Senatorial sanction. The Second Triumvirate, 43 B.C., was formed under the approval of the Senate by Octavian (Augustus), Lepidus, and Mark Antony.

Related Subjects. Supplementary information concerning these famous triumvirates may be gained from the following articles in these volumes.

Antony, Mark	Lepidus, Marcus
Augustus	Aemilius
Caesar, Caius Julius	Pompey
Crassus, Marcus Licinius	Rome (History)

TROCADÉRO. It was in this building that the American Legion held its annual reunion, in 1927, on the tenth anniversary of the entry of the United States into the World War. See **PARIS** (Notable Buildings).

TROCHAIC, *tro ka' ik*, **METER.** See **METER.**

TROCHELMINTHES, *trok el min' theez*. See **ZOOLOGY** (Divisions of the Animal World).

TROGLODYTES, *trog' lo dītes*, a word meaning *cave dwellers*, was applied by the ancient Greeks to a tribe or race who dwelt in caverns or holes which they dug for themselves in the ground. They herded cattle and were hunters and sometimes robbers. We read of them as being employed in the army of Xerxes. They drank a mixture of milk and blood, and they killed the aged when the latter were no longer able to attend to the cattle. Herodotus, Strabo, and Aristotle vouch for their existence.

TROGON, *tro' gahn*, a family of birds found in warm regions in both the eastern and the western hemispheres, noted for their beautiful plumage. They have a peculiar foot structure, as the first and second toes are reversed. The bill is short and strong, the tail usually elongated, and the feet are small and weak. The Old-World trogons feed chiefly on insects; the American species eat fruit, lizards, grasshoppers, ants, beetles, and small crabs. One of the most interesting and brilliantly colored of the group is the Central American *quetzal*. For description and picture of this bird, see **QUETZAL**. D.L.

Classification. Trogons constitute the family *Trogonidae*. There are about fifty species.

TROJAN WAR. See **TROY.**

TROLLEY LINES. See **ELECTRIC RAILWAY.**

TROLLHÄTTAN, *troll hel' an*. See **SWEDEN** (Rivers and Lakes).

TROLLING, *troll' ing*, a method of fishing with a moving line and bait, usually drawn

behind a slowly rowed boat. It is a sport dear to the angler who does not care for an easy victory, for the game fish that are caught in this fashion are worthy of any fisherman's mettle. The giant tarpon of the West Indies and the Florida coast, and the savage muskellunge, the undisputed monarch of the northern lakes, are among the chief prizes taken by trolling. In order to make the lure more tempting to the fish, the angler may use what is called a spinning bait, which deceives the fish into believing that it is about to swallow a live morsel. Originally, this was simply the bowl of a teaspoon to which a hook had been soldered; the present spoon hook, however, is a bit of flat, polished metal, which skips and spins along or near the surface of the water. It is made still more irresistible to hungry fish by a gaudy tuft of feathers. Many other artificial lures are available for the fisherman who trolls. The line must be particularly tough and strong for the heavier fish. Trolling from the shore is also sometimes practiced. See **ANGLING**.



THE TROGON

TROLLOPE, *trol' up*, **ANTHONY** (1815-1882), an English writer whose fame rests chiefly on his stories of contemporary English life and manners, which are admirable examples of realistic fiction. Trollope was born in London. He passed an unhappy boyhood and was poorly educated, and when, at nineteen, he entered the postal service, he had given no promise of the unusual literary ability that he later displayed. He began writing fiction in 1847, but it was not until 1855, when *The Warden* was published, that he won recognition

as a novelist of merit. Once launched on his career, he wrote tirelessly, and amassed a fortune before he died. His mother, Frances M. Trollope, was a voluminous writer of novels and travel sketches.

Literary Achievements. Trollope is at his best in his novels portraying the life and characters of English cathedral towns, represented by *The Warden*, *Barchester Towers*, *Doctor Thorne*, *Framley Parsonage*, *The Last Chronicle of Barset*, and others, the whole series being grouped under the title *The Chronicles of Barsetshire*. The reality of his characterizations outweighs the author's obvious faults of triviality and repetition. His other novels, some of them very successful in their day, include *Can You Forgive Her?*, *Phineas Finn*, *The Eustace Diamonds*, *He Knew He Was Right*, and *The American Senator*. Trollope's travel sketches, an estimate of Thackeray, and his biographies of Caesar and Cicero are inferior pieces of writing, but he gives much interesting information in his *Autobiography*.

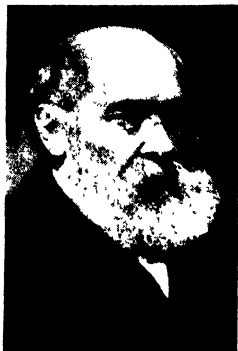


Photo: Brown Bros.

ANTHONY TROLLOPE

TROMBONE, a musical instrument on the order of a trumpet, used in orchestras and military bands because of the volume, depth, and richness of its notes. It consists of a tube twice bent, ending in a trumpet-shaped bell, and sounded by means of a cup-shaped mouthpiece and a slide mechanism. By the manipulation of the slide, the air tube is altered in length and the pitch is accordingly varied from the fundamental. The instrument is at its highest



THE TROMBONE

pitch when the slide is closed. Like the violin, the trombone has a complete chromatic scale. There are four sizes, called *alto*, *tenor*, *bass*, and *contrabass*. The forms usually seen in concert halls are the alto, tenor, and bass, for when played together, these three sound in perfect harmony. In a later type of instrument, there are valves instead of the slide mechanism, but the tones produced are less pure than in the older type.

The dramatic qualities of the trombone have been recognized by the great composers. Warning, wrath, religious exaltation, solemnity, and triumph have all been suggested by the scores for this instrument.

TROMP, MARTIN HARPERTZON (1597-1653), a Dutch naval officer, who, during his

career, was victor in more than thirty naval engagements. He was born in Brielle, Holland. His father was captain of a merchantman, and Martin went to sea with him when eight years old. In a fight with an English frigate, the elder Tromp was killed and the boy was taken prisoner on board an English ship. He was subsequently captured by Moslem pirates, but escaped several years later, when he returned to Holland to take service under the Dutch flag.

When, in 1637, Tromp attained the rank of vice admiral, he reorganized his fleet, which was poorly equipped and badly trained. In 1639 he sailed to meet the enemies of his country, and won a brilliant victory over the Spanish fleet off Gravelines, completely destroying it. On his return, Tromp was made admiral of Holland.

In 1652, when the English, by the Navigation Act and other commercial measures, precipitated the war with Holland, Tromp was entrusted with his country's defense. At first he was victorious against the English commander, Blake, and controlled the English Channel for about three months. The British then built new and powerful ships, and when, in February, 1653, Tromp left Holland with a convoy of richly laden merchantmen, Blake attacked him. Tromp kept up a gallant running fight, and though his vessels were shattered, he managed to bring many merchantmen safely to Holland.

Again, in June of the same year, the two fleets met, but the Dutch vessels, poorly manned and equipped, were no match for the enemy, and sought refuge in the Texel. Once more, however, Holland got together an inferior fleet (composed mostly of converted merchantmen), and Tromp set out on what was acknowledged a "desperate task." He broke the English blockade, but twenty-four of his ships having deserted, the British won the victory. In this battle, Tromp was shot through the heart.

TRONDHJEM, *trahn' yem*, an important seaport of Norway, the name of which was changed to NIDAROS by act of the Norwegian Storting, effective January 1, 1930. See NORWAY (The Cities).

TROPIC BIRD OR **BOATSWAIN**, *boht'-swayn*, a bird which flies continually over tropic waters, diving perpendicularly for fish, in the



Photo: Brown Bros.

ADMIRAL TROMP

MARVELS *of the* TROPICS



OIL PALM
LIBERIA



ORCHID-
AUSTRALIA



BANANA-
VENEZUELA



SENECIO
TORCH-
AFRICA



LOBELIA CANDLE-
AFRICA



CACTUS
FRUIT-
BRAZIL



GIANT HEATHER
AFRICA



BREAD FRUIT - SAMOA



COCONUT
PALM -
SOUTH SEA
ISLANDS



BALSA TREE
FRUIT AND
FLOWER -
PANAMA

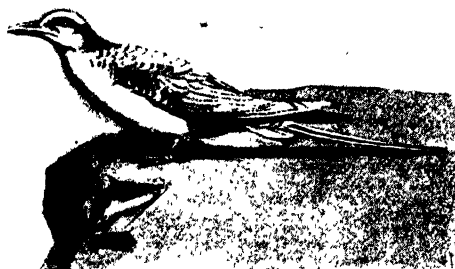


CANDLEWOOD-
SOUTH AMERICA



SILVER
SWORD
PLANT -
HAWAIIAN
ISLANDS

manner of terns, but distinguished from them by its long, willowy, middle tailfeathers. Its plumage is pure white or pinkish in color, and of a remarkably soft, satiny appearance. The best-known species is the *red-billed tropic bird*, which occurs accidentally as far north as Newfoundland. It is pure white, with a coral-red



THE TROPIC BIRD

bill, and is nearly forty inches in length, twenty-six inches being the measure of the tail. Other species are the *yellow-billed* and the *red-tailed*. All tropic birds nest in colonies, making their homes in holes, in crevices in the rocks, or on the bare sand. The one egg is whitish or brownish, mottled with dark brown. Male and female incubate in turn.

D.L.

Scientific Names. The tropic birds belong to the family *Phaethontidae*. The red-billed is *Phaethon aethereus*; the yellow-billed *P. flavirostris*; the red-tailed, *P. rubicauda*.

TROPIC OF CANCER. See ZONE; TROPICS.

TROPIC OF CAPRICORN. See ZONE; TROPICS.

TROPICS, in astronomy, two small circles on the celestial sphere, lying parallel with the celestial equator and distant from it twenty-three and one-half degrees each. They mark the seeming limits of the sun's journeys north and south of the equator. The northern one touches the ecliptic at the zodiacal sign Cancer, and is accordingly called the Tropic of Cancer; the southern tropic takes the name Capricorn for a similar reason.

[The term *tropics* is derived from a Greek word meaning a *turning point or limit*.]

In Geography. The tropics are the two parallels of latitude which pass through the extreme southerly and northerly points on the earth's surface at which the sun can be seen directly overhead. The tropic north of the equator is the Tropic of Cancer and that south of the equator the Tropic of Capricorn. Each is twenty-three and one-half degrees from the equator. The tropics mark the limits of that zone of the earth's surface which has the highest temperature, with a comparatively small

range of variation throughout the year. This is called the *Torrid Zone*. The regions included in it are usually spoken of as *the tropics*. F.B.L.

Tropical Plants. Plant life in the tropics exhibits a great variety of species and of form. From the majestic palms of the South Seas to the dense jungle growths of tropical Asia, Africa, and South America, there is a vast range of characteristic vegetation, unknown to temperate zones. For scientific purposes, the vegetation of tropical districts has been subdivided into tropical woodland, tropical grassland, and tropical desert, with mangrove swamps in a class by themselves. Tropical woodland, in this classification, includes the vegetation of rain forest, monsoon forest, savanna forest, and thorn forest. Tropical grassland includes savannas and steppes; and tropical desert includes growths of scrub, succulent plants, and perennial herbs. See color plate herewith.

In a tropical rain forest, there is a great diversity of trees, shrubs, and other plant forms, including masses of tangled lianas, or creeping plants, like vines. Many of the trees, including the tallest, bear a wealth of flowers, usually in their leafy crowns, and thus often present a spectacle of highly colored magnificence and beauty. In some tropical forests, there is dense foliage, reaching from the ground to the tree tops, thus darkening the forest and making it almost impenetrable to man, though it usually abounds in animal inmates. In other cases, in the tropics, the rain-forest growths may consist of trees and plants that afford a free passage and a clear view. In the forests of denser growth, where the tropical plants are engaged in a constant struggle for light, one common result is that a large number of air plants (*epiphytes*), including orchids, mosses, and lichens, are found on the high branches of the trees.

In a rain forest, the leaves of the trees are usually evergreen; but in a monsoon forest, or tropical forest in a district with seasonal rainfall, the trees usually lose their foliage during the dry season, and regain it during the rains. Savanna forests and thorn forests occur where the rains are less abundant, and tropical grassland is found where the precipitation is still less. Each type of tropical district has its own plant life, on a descending scale of size and profusion, from the rain forest to the grassland and the desert, the latter being more common in the subtropics.

The palm tree is perhaps the most striking of tropical plants, and its profusion in nature may be judged from the fact that the palm group includes about 150 genera and 1,200 species. Among these are the date palm, coconut palm, oil palm, betel palm, wax palm, rattan palm, palmyra, and various palmetto and cabbage palms—all of which serve to en-

hance the picturesque beauty of the tropics, and to make life therein more endurable for the human race.

T.H.R.

Related Subjects. The reader is referred in these volumes to the following articles:

Astronomy	Ecliptic	Zodiac
Cancer	Capricornus	Zone

TROTZKY, *trots' ke*, LEON (1879-), whose real name is LEV DAVIDOVICH BRONSTEIN, is a Russian Jew who rose from penury to the second most powerful post in Russia, after the revolution of 1917.

He was born near Elizavetgrad, and educated at Odessa. Imbued with revolutionary ideas from childhood, before he was twenty years old he was arrested and banished to Siberia. Forging a passport with the fictitious name Trotzky, which he subsequently adopted, he managed to escape to England in 1902. Here he had for companions such zealous revolutionists as Plekhanov and Lenin. The Russian uprising of 1905 found him a prominent member of a Saint Petersburg (now Leningrad) Soviet, the entire body of which was arrested; again Trotzky was exiled to Siberia, but as soon as he arrived there, he escaped. For the next few years, he roamed Europe, always an agitator, sometimes finding employment on a revolutionary newspaper, and at other times working at whatever was offered. Trotzky was outspoken in his disapproval of the World War, and, ever active as a plotter, he was requested to leave France and Spain. Finally, he sought refuge in New York City, where he worked on a radical newspaper.

After the czar's downfall, in 1917, Trotzky hurried to Russia, and eventually allied himself with Nikolai Lenin in the new Bolshevik government, becoming Minister of Foreign Affairs and later Minister of War. After the death of Lenin, early in 1924, Trotzky lost the favor of his fellow officials, some of whom were inordinately ambitious, and he was deprived of power. The next year saw his return to Moscow, with his authority restored. In 1927 the Soviet rulers, under inspiration of Stalin, expelled him from the Communist party. The following year, he was expelled from Russia and sent to Turkestan, and in 1929 to Constantinople. Unhappy in his Turkish environment, he made unsuccessful attempts to gain

admission to Germany and England, pleading need of medical care, rather than political ambitions.

His Writings. Trotzky has written several books and essays on political and social subjects. His works in English include *Defence of Terrorism, 1917; Lenin; and Where Is Britain Going, Towards Socialism or Capitalism?*

Related Subjects. The reader is referred in these volumes to the following articles:

Bolsheviki	Russia (History)
Communism	Soviet
Lenin, Nikolai	World War

TROUBADOUR, *troo' bah door*, one of a group of lyrical poets who flourished in Southern France between the eleventh and the fourteenth centuries. As composers of charming love poems, expressed in the musical Provençal dialect, they stand out in literary history as interesting figures of the romantic age of chivalry. They idealized beauty, grace, and courtesy, and in their verses lauded the romance of war and adventure, but, more than all, they sang of the beauty of love. There were two classes of troubadours, the professional, who led a wandering life, traveling from court to court and singing their verses to admiring knights and their ladies; and the amateurs, among whom were kings and nobles. Some attached themselves to the households of their feudal lords. Those of the troubadours who could not sing taught their verses to professional musicians called *jongleurs*. Sometimes the jongleurs accompanied the poets and played while the latter sang, and occasionally the jongleur himself was a troubadour. See MINSTREL; FRENCH LITERATURE (Early Stage).

TROUBETZKOY, PRINCESS. See RIVES, AMÉLIE.

TROUT belong to the same family as the salmon, and include many species which are important food and game fish. Nearly all kinds of trout are inhabitants of fresh waters, and they are much sought by anglers who frequent northern lakes and rivers. As a rule, they are gamy and possess voracious appetites. Scientists divide these fish into two main groups, the *black-spotted*, or *true*, *trout*, and the *charrs*. True trout are placed in the same genus as the Atlantic salmon (see SALMON). To the charrs belong the handsomest and most active of the trout species.

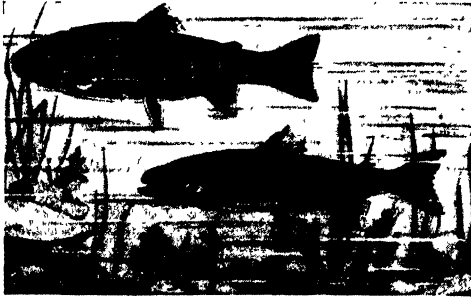
Probably the best-known charr is the beautifully colored *brook*, or *speckled trout*. This fish was found originally in the Appalachian regions, westward through the Great Lakes territory to Minnesota, and in the Dominion of Canada from the Saskatchewan River to Labrador, but has been introduced into various lakes and streams of the upper Mississippi Valley and the West. It thrives in cool, clear waters with a gravelly bottom, where the current is strong and there are rapids and deep



Photo: Brown Bros.

LEON TROTZKY

pools. The fish spawn in the cold weather of the fall, and the eggs hatch when the temperature of the water has begun to rise in the spring. During the winter, this fish may descend rivers and enter salt water, usually remaining in the mouths of the rivers or in small coastal bays. The brook trout attains a length of a foot and a half in large bodies of water, but fish of this size are becoming rarer all the time, owing to their popularity as game.



TWO SPECIES OF TROUT

Above, brook trout; below, the Dolly Varden.

Anglers speak of their coloring as the "bloom of the trout," for the back is marked with dark olive and black, the sides are spotted with red, and the fins have dark and orange mottlings. The season for angling for brook trout is strictly limited by law.

The native charr of the Pacific-coast waters is the *Dolly Varden*, a fish with a more slender body than the one described above, and with red spots on both the back and the sides. The larger specimens are two or three feet long and weigh from five to twelve pounds. The flesh is delicious, like that of the brook trout, and the Dolly Vardens taken in swiftly flowing, cold streams are game fighters.

The most northern charr, the *Arctic*, is found north of Hudson Bay. It connects an American species, the *sunapee*, with the *European brook trout*, found in cold lakes and mountain streams in the northern part of the continent. The *sunapee* is an inhabitant of Sunapee Lake, N. H., and Flood Pond, Me., two lakes whose waters are very cold and clear. It is noted for its beautiful coloring and active, graceful movements.

The largest species of trout is a coarse charr known as the *Great Lakes trout*. It is found in the Great Lakes and large lakes northward. This trout bears numerous local names. It has small pale-yellow spots all over its body, and weighs fifteen to twenty pounds. Among the Great Lakes fisheries, only those of the white-fish are more valuable commercially than those of the lake trout.

The most important of the true trout are the *cuthroat trout*, the *rainbow trout*, and the

steelhead, or *salmon trout* (see SALMON TROUT). About twenty species of this group are found in the streams or lakes of Western North America. The steelhead is the only one of great commercial importance. L.H.

Scientific Names. The true trout belong to the genus *Salmo*; the Great Lakes trout is included in the genus *Cristivomer*. The other charrs mentioned are species of *Salvelinus*. The speckled trout is *Salvelinus fontinalis*.

TROUT LILY. See DOG-TOOTH VIOLET.

TROUT PERCH, a small fish of North America, one well-known genus being the *sand roller* of the Great Lakes. The form of the body and of the head and mouth are like those of the perch, but the fins are more like those of the salmon. The trout perch is therefore believed by scientists to be a survivor of old forms no longer existing. It belongs to the suborder *Salmopercae*. See TROUT; SALMON.

TROUVÈRES, *troo vair'*, medieval court poets, who were to the north of France what the troubadours were to the southern part of that country (see TROUBADOUR). The name comes from the French word *trouver*, meaning *to find*, or *invent*. These poets invented songs and metrical tales which were sung or recited by others, or by the trouvères themselves. Their poems were principally of an epic character, in contrast to the lyrics of the troubadours. The trouvères, who were often men of high rank or social position, occupied an important place in early French literature, and helped to develop the French characteristics of wit and refinement. See FRENCH LITERATURE (Early Stage).

TROVATORE, *IL*, *tro vah to' ray*, *eel*. See OPERA (Some of the Famous Operas). It was first sung in the United States in 1855.

TROWBRIDGE, *tro' brij*, JOHN TOWNSEND (1827-1916), an American novelist, poet, and writer of stories for boys, was born on a farm near Ogden, N. Y. He obtained a part of his education at a country school, but the larger share of it he acquired through his own efforts. Before he was twenty years old, he taught school for two years in Illinois; then went to New York and later to Boston, to write for newspapers and magazines. He was connected with a number of publications as contributor and editor, and wrote some thirty interesting and wholesome stories for boys, besides other volumes of fiction and poetry.

Representative Works. *My Own Story*, which appeared in 1903, is his autobiography. His first book, *Father Brightshoes*, attracted little attention, but *Neighbor Jackwood*, a story of New England life and a strong protest against slavery, published in 1857, brought him into prominence. His best poems are found in *Vagabonds and Other Poems*. Among his books for boys are *Cudjo's Cave*, *The Jack Hazard Series*, *The Tide Mill Series*, and *The Prize Cup*.



TROY, OR ILIUM, an ancient city of Asia Minor, made famous by one of the greatest poems of all time—the *Iliad*. That there really was such a city, recent excavations have made very probable, and the large part which it played in the legends of the Greeks shows that it must have been a place of considerable size and importance. All the marvelous things which the Greeks told of Troy happened in prehistoric days, in the twelfth century B.C., but within historic times, about 700 B.C., the Greeks built a city, Ilium by name, on what they supposed was the site of the ruined city. Ruins of several cities, in fact, have been found buried, one beneath the other, on the traditional site of Troy. Archaeological research has further shown that there was an actual siege of Troy, probably occasioned by the abduction of a real Helen. The dates for the

beginning of the war and subsequent events have been ingeniously estimated by a German astronomer, who uses as a basis the account of a total eclipse of the sun recorded in the twentieth book of Homer's *Odyssey* (the story of the wanderings of Ulysses). The chronology thus worked out places the Trojan War in the decade 1107-1187 B.C., and the wanderings of Ulysses in the decade 1187-1177 B.C. Egypt was the most advanced nation of that period, and within a century from the fall of Troy, the tribes of Israel were becoming united under King Saul. The weapons of the Greek and Trojan warriors were made of bronze, for iron had not yet come into general use.

The story of the Trojan War follows; details of preceding and subsequent events connected with this stirring tale are given in the articles listed at the close of this article.

The Trojan War

Paris. In the days of Priam the king, Troy became a great city, but there were signs of approaching disaster. When Prince Paris was born, it was foretold that he would bring trouble to his country, and to avoid this, the royal father ordered the boy to be exposed on a hillside to die. The servants did his bidding, but scarcely had they gone when an old shepherd found the beautiful boy and carried him to his home. There Paris grew up, tending the flocks of his foster father, on Mount Ida.

The Golden Apple. When Paris had become a young man, handsome as any god, there occurred a wonderful wedding, to which no one thought of inviting him. It was the wedding of the sea nymph Thetis with Peleus, and to it came all the immortals except Eris, goddess of discord. To avenge the slight shown her, Eris threw among the guests a golden apple bearing the inscription, "For the fairest," and she accomplished her purpose, for out of it arose a wrangle which resulted in the disastrous siege of Troy. Venus, Juno, and Minerva all jealously claimed the apple, and a most unseemly quarrel ensued, of which Paris was finally chosen to be judge.

All three goddesses appeared before him on Mount Ida, each offering him a bribe if he would decide for her.

"I will give you power and riches," declared Juno.

"I will make you a famous warrior," said the martial Minerva.

"I shall give you the most beautiful woman on earth for your wife," smiled Venus.

Not because of her promise, but because she was really the most beautiful, Paris gave the apple to Venus. He needed no beautiful wife, for he had already wedded the nymph Oenone, whom he loved; but by his decision he won not only the hatred of Juno and Minerva, but the still more disastrous favor of Venus.

Helen of Troy. After awhile, Paris was recalled to his father's palace, and later set out on a journey to Sparta, in Greece, urged on by Venus, though this he did not know. There he met Helen, wife of the Spartan king Menelaus, and the most beautiful woman on earth; and with her he fell in love. Through the influence of Venus, Helen returned his love. Whether she consented to flee with him to Troy or he abducted her, there is doubt; but she went, forgetting apparently that all the heroes of Greece had promised to aid her husband, Menelaus, if any disaster ever overtook him. The heroes were true to their oath, and preparations for an expedition against Troy began.



From the painting by Rubens

THE DEATH OF ACHILLES

[The original painting is in the Kaiser Friedrich Museum, Berlin.]

They took some time, these extensive preparations, and many difficulties stood in the way of the Greeks. First, Ulysses, wisest of the Greeks, had to be induced to join the expedition; then Agamemnon, the Greek commander in chief, had to placate Diana by the sacrifice of his daughter Iphigenia, but finally the fleet set sail for Troy, where preparations had also been in progress.

The Siege of Troy. For nine years the struggle went on, with varying fortunes. The Trojans were compelled to shut themselves up within their city, but beyond that the invaders were able to accomplish nothing. Then came the "ruinous wrath" of Achilles, greatest of Greek heroes, which was almost fatal to the Grecian cause and which he was induced only by the death of his friend Patroclus to lay

aside. With Achilles once more fighting for them, the Greeks felt a return of confidence, and when Hector, the noble hero of Troy, was killed, it seemed as if their victory was won. But Achilles himself was slain soon afterward by the treacherous Paris, and matters were again at a standstill.

The Wooden Horse. But the crafty Ulysses devised a plan. He induced the Greeks to build a gigantic wooden horse, and to conceal in it a body of armed men, while all the rest of the Greeks took to their ships, apparently with the intention of sailing for home. The stratagem was successful. The curious Trojans, despite the warnings of Laocoön, priest of Neptune, dragged the wonderful horse within the city walls, and in the night the armed men crept out and let into the city the Greek forces,



From the painting by Rubens

"THE JUDGMENT OF PARIS"

The incident of the golden apple, involving Paris, Venus, Minerva, and Juno; it indirectly led to the Trojan War. This is one of the most famous of the world's paintings on mythological subjects, executed by one of the greatest artists of all time. [The original is in the Madrid Museum.]

which had stolen back under cover of the darkness. The terrified Trojans rushed from their houses, only to fall by the swords of the Greeks, and in a brief time the whole city was in flames. A few escaped, and one great chieftain, Aeneas, embarked on a most marvelous voyage (see *AENEID*).

So fell Troy. The Greeks could claim for themselves no proud victory, since it was by craft, and not by valor, that the long siege was ended.

Related Subjects. The following articles in these volumes will be of interest in connection with this story of ancient Troy:

Achilles	Laocoön
Aeneas	Menelaus
Aeneid	Minerva
Agamemnon	Odyssey
Apple of Discord	Paris
Eris	Penelope
Hector	Priam
Helen of Troy	Thetis
Iliad	Ulysses
Iphigenia	Venus
Juno	Wooden Horse

TROY, N. Y., the county seat of Rensselaer County, is situated in the central-eastern part of the state, on the east bank of the Hudson River, at the head of tidewater navigation opposite the main outlets of the Erie and

Champlain canals (see *NEW YORK STATE BARGE CANAL*). Albany, the state capital, is six miles south, and New York City is 151 miles south. Population, 1928, 72,300 (Federal estimate).

The city lies for the most part on a narrow strip of land extending along the river for seven miles, and eastward to hills that rise in some places to a height of about 500 feet. Four bridges connect it with Watervliet, Cohoes, Green Island, and Waterford, on the opposite side of the river. A new concrete bridge to Cohoes, replacing a burned structure, was opened to traffic in 1923. Here was once the oldest covered bridge in America. The city has a park area of 276 acres.

A community hotel, erected by the citizens of Troy and called the *Hendrick Hudson*, was opened in 1928, and since that time the city has entertained numerous national gatherings of military, philanthropic, fraternal, and academic organizations, so that it now lays claim to being a "convention city." The close proximity of Albany, the state capital, and of historic points along the Hudson, adds greatly to the attractions of Troy for visitors, while its manufacturing establishments are objects of great interest.

Transportation. Steamers and barges ply regularly between Troy and New York, and there is water communication with the Great Lakes through the Erie Canal, and with Canada through the Champlain Canal. Railway transportation is provided by the New York Central, the Delaware & Hudson, and the Boston & Maine railroads, and interurban and motorbus lines afford passenger and freight service to near-by cities.

Industry. The city of Troy is noted especially for the manufacture of men's linen wear, including shirts, collars, and cuffs. Ninety per cent of the men's collars made in the United States are manufactured in Troy, and special machinery for the industry is also made there. There is also one of the largest factories in the Union for making mathematical and engineering instruments; also one of the largest valve plants in the United States.

A new six-million-dollar blast furnace and coke-oven plant, in which pig iron, coal tar, ammonium sulphate, and benzol are produced, has helped to make Troy one of the largest iron-manufacturing centers in the Eastern states. There are in all over 250 manufacturing concerns, many of which are among the largest of their kind in the country. Among the leading products are abrasives, hydrants, bells, chains, brushes, and automobile parts. At Troy the state has constructed a dam across the Hudson River, and the water power thereby obtained, with that of the Wynantskill and Poestenkill rivers, each having a fall of about 200 feet, offers special facilities for manufacturing.

Education. In addition to its public-school system, the city has Emma Willard School for Girls. It was established in 1825 as the Troy Female Seminary, and was among the first institutions of its kind in the United States. Rensselaer Polytechnic Institute is a famous school of civil engineering, founded in 1824, and the city has also Russell Sage College of Practical Arts for Women.

History. The site of Troy was bought from the Indians in 1659 by Jan Wemp, and passed to Derick Van der Heyden in 1707. It was then known as Van der Heyden's Ferry, and as Ferryhook, until 1789, when the town received its present name. This was adopted in town meeting, after an influx of settlers from New England. The appellation "Uncle Sam" was first applied to the United States government in Troy during the War of 1812, it is claimed, when large quantities of provisions for the American army, labeled "U.S.," were sent from the city. Samuel Wilson, familiarly called "Uncle Sam," was the official inspector, and the provisions soon became known as "Uncle Sam's." The collar industry dates from about 1819, when Hannah Lord Montague of Troy originated the idea of making separate collars for her husband's shirts. Manufacture of cuffs in Troy began in 1845. The city was incorporated in 1816, and in 1901 it annexed Lansingburg.

TROYES, an ancient town in France, still flourishing as a textile center. It gave its name to troy weight (which see).

TROYES, *trwah*, PEACE OF. See HENRY (V, England).

TROY WEIGHT, a standard system used in weighing gold, silver, platinum, and coins; also jewels, except pearls and diamonds, which are weighed in carats, one carat being equal to 3.17 grains troy. *Troy* is derived from *Troyes*, the name of a French town that was an important commercial center in the fourteenth century. Like many other towns of that period, it had its own system of weights and measures, and the *pound of Troyes* became widely known. The derivative *troy*, however, came to have no connection with the name of this particular town, but was used to designate a system in which the pound contained twelve ounces, the ounce was equal to twenty pennyweights, and the pennyweight equal to twenty-four grains (see table in DENOMINATE NUMBERS). The troy pound and the apothecaries' pound are alike in having 5,760 grains each. The pound avoirdupois is equal to 7,000 grains. The grains in all three systems are equal. See POUND.

TRUCE, FLAG OF. See FLAG (As a Symbol); FLAG OF TRUCE.

TRUCHAS, *troo' chahs*, MOUNT. See NEW MEXICO (The Land).

TRUCKEE RIVER. See TAHOE (lake).

TRUCK FARMING. See VEGETABLES; INTENSIVE FARMING.

TRUE BILL. See JURY AND TRIAL BY JURY (Grand Jury).

TRUE BLUE. See BLUE (As an Emblem).

TRUMBULL, JONATHAN (1710-1785), an American patriot from whom tradition says the name "Brother Jonathan," as typifying the people of the United States, was derived. He is said to have been the only colonial governor who supported the patriot cause in the Revolutionary War. Trumbull was born at Lebanon, Conn., was graduated at Harvard in 1727, and after studying theology, was licensed to preach. Afterward, he adopted the profession of law, and in 1733 was elected to the general assembly of Connecticut, becoming speaker in 1739. He served as judge of the county court, and from 1766 to 1769 was chief justice of the superior court. For fourteen years, from 1769 to 1783, Trumbull was governor of Connecticut colony, and Bancroft, the historian, said of him that he was possessed of all the virtues of a rural magistrate. He took a prominent part in the events leading to the Revolutionary



Photo: Brown Bros.

JONATHAN TRUMBULL
"Brother Jonathan."

War, and was the chosen friend and counselor of Washington, who placed great confidence in him. The latter is reported to have frequently said, when troubled about some important matter, "Let us hear what Brother Jonathan says," or words to that effect. In time, the phrase "Brother Jonathan" was used as a nickname for the whole people (see BROTHER JONATHAN). In 1872 Trumbull's native state of Connecticut presented his statue to Statuary Hall (which see).

TRUMPET, the most ancient of wind instruments, its known history dating as far back as 2000 B.C. It is of brilliant and penetrating tone, especially adapted to the expression of martial sentiments, songs of triumph, tragedy, vengeance, and other impassioned ideas. Essentially, it is a long, narrow tube, curved back upon itself twice, cylindrical in two-thirds of its length, and conical in the remainder. The various tones are produced by vibration of the player's lips and pressure of the breath. The mouthpiece has the form of a shallow cup, and the other end is a flaring bell. Before the introduction of the modern valve trumpet, the player had to use lengthening pieces to vary the key of the instrument; later, the slide trumpet was used to secure the effect of the chromatic scale. Piston valves, each one of which controls a certain length of tubing, are a part of the mechanism of the trumpet used in modern orchestras and wind bands. Trumpets are made in *C*, *B*, *B \flat* , *E*, and *F*. The *C* trumpet produces notes of the actual pitch.

Both the bugle and the trumpet are used to summon soldiers to their duties, and to convey commands of field officers, the trumpet being the special instrument of the cavalry. See BUGLE.

TRUMPET CREEPER. See BIGNONIA.

TRUMPET FLOWER. See BIGNONIA.

TRUST, in economics, means an industrial monopoly. A trust may be said to exist when a person, corporation, or combination owns or controls enough of the plants producing a certain article to be able, for all practical purposes, to fix the price at which it shall be sold. Control over the price is the fundamental test of monopoly. The term trust does not, however, include monopolies in the so-called public-service industries; such as, for example, railroads and telephones. It applies only to monopolies built up by combinations of capital.

Pools. The modern-day trust was preceded by a number of other devices resorted to for the purpose of restraining competition among manufacturers. The first and most common of these devices was the *pool*, an arrangement whereby a number of concerns, each preserving its own organization and, to a large degree, its own independence, adopted measures looking toward the maintenance or raising of the

prices of the articles produced by them, or the depression of the prices of the materials and supplies required by them. The pool in the industrial world may be compared, so far as its organization is concerned, to a League of Nations in the political world. The members of the pool, like the members of the League, retain full control over certain matters, but temporarily delegate certain powers to a central organization. Upon the disbanding of the pool, as upon the dissolution of the League, the members resume complete control over their affairs.

There are various kinds of pools. In some cases, the output is fixed and apportioned among the members. In other cases, there is a division of territory among the members. In still other cases, a central selling agency is created, to make the sales for the members. Though pools are still common in the United States (and even commoner in certain European countries, where they are sanctioned by public policy), they proved to be an unsatisfactory device for restraining competition. They were weak in two respects. In the first place, they were not able to maintain a sufficient degree of stability with respect either to prices or to industrial policy. The individual members of the pool retained a large degree of independence, and their conflicting interests frequently led to the dissolution of the agreement. In the second place, the pools had no legal status; the courts would not lend aid to their enforcement, because they were regarded as contrary to public policy. Accordingly, a new device for restraining competition was employed.

The Voting Trust. The new device was the so-called *voting trust*, from which the modern trust derived its name. Under the voting-trust arrangement, the stockholders of the companies to be brought together assigned their stock to a board of trustees, who voted the stock, and thus controlled the affairs of all the companies. The stockholders, in return for their stock, received trust certificates, which could be transferred like ordinary certificates of stock. The Standard Oil Company employed this arrangement in 1882, and its example was soon imitated by a number of other companies. But these voting trusts, as a device for achieving monopoly, did not last long. The courts soon held that they were unlawful; in the first place, because the parties thereto had delegated their essential corporate powers to an irresponsible board, contrary to the privileges granted to them by their charters; and, in the second place, because the whole arrangement was in effect a partnership of corporations, and for corporations to enter a partnership is unlawful.

Modern Trust. The next device resorted to for the purpose of restraining competition was the modern *trust*. The trust was some-

times effected through the medium of a holding company; that is, a company formed to acquire at least a majority of the voting stock of the concerns to be combined in the trust. The controlled companies maintained their separate existence, and were nominally independent; yet, inasmuch as the holding company elected their directors, it effectively controlled their management, and was able to operate the several properties in accordance with a unified plan. Other trusts took the form of a corporation owning outright the plants and other property of the companies that were united in the trust. The modern trust movement dates from 1898. In that year and the years immediately following, many trusts were formed; in fact, there was a veritable craze to monopolize industry. Prominent among the trusts organized during this period were the Standard Oil Company of New Jersey (1899); the United States Steel Corporation (1901); and the International Harvester Company (1902).

Explanation of the Movement. The primary explanation of the trust movement, notably that characterizing the period from 1898 to 1903, was the desire of the manufacturers to restrict or eliminate competition, and thus to establish monopoly prices. In a sense, the trust movement was a natural development of the factory system. As this system developed, it was found that most commodities could be produced more cheaply on a large scale than on a small scale. This discovery led to the enlargement of operations, which, combined with improved means of transportation and communication, brought factories actively into competition with one another. But production on a large scale involved large investments of capital which could not easily be withdrawn. Competition was therefore at times very severe, to the detriment of profits. Combination, resulting in the elimination of competition, seemed to offer a way out of the difficulty. Accordingly, many trusts (industrial monopolies) were formed, and prices were advanced to a monopolistic level.

A secondary influence was the hope of achieving the economies of the trust form of organization. It is generally recognized that competition is wasteful in many particulars; and it was believed that the trust, having a monopoly, would be able to effect many savings that were not available to concerns engaged in active competition with one another. This matter is discussed below at more length. A third influence was the lure of large profits for the trust promoters, men who conceived the idea of a trust in a given industry, or, if they did not conceive it, at least carried it through to a successful consummation. The promoters of the United States Steel Corporation, for example, realized a profit of \$62,500,000. This

was an unusual case, of course, but there can be no doubt that the prospect of securing promotion profits did contribute markedly toward the formation of numerous trusts.

Advantages. At the time when trusts were being created in large numbers, much was said about the economies that would be realized. The promoters naturally wished to secure public approval of a movement that, on its face, seemed to be fraught with danger to the people; accordingly, they laid great emphasis upon the wasteful character of competition and the savings in cost that were to be effected under the new order. The alleged advantages were numerous—much too numerous to chronicle fully. They may be grouped under three heads: economies in selling; economies in production; and economies in bargaining.

It was alleged that a trust could conduct the sale of products at a lower cost and to greater advantage. Advertising expenditures could be curtailed, traveling salesmen dispensed with, the export trade developed with greater success, and cross freights saved, through the filling of orders from the particular plant of the trust that was nearest to the consumer. It was maintained, secondly, that a trust could effect a reduction in the cost of production. Gains were to be realized through the more continuous operation of plants, the greater utilization of by-products, the specialization of ability, the specialization of plants and machinery, the employment in each plant of the best devices, including patents, and competition between the plants of the trust, this competition taking the place of the former competition between individual producers. It was claimed, thirdly, that the trust could effect certain savings through its superior bargaining power, notably in its relations with the producers of materials and supplies, the distributors of its products, and its employees.

Some of the defenders of the trusts were sincere in their support of monopoly as a more effective economic agent. Some of the economies above set forth were realized in a number of instances. But that the case for the trust was much overstated is made clear by the subsequent history of the trusts. Many of them succumbed to the new competition that sprang up in the years that followed, and eventually lost all semblance of monopoly control. Others made good profits, but found themselves unable to maintain their monopolistic position. Still others not only made excellent profits, but retained their monopoly. At the present time, though large-scale production is making further progress, and combinations are being formed from time to time, there are by no means as many trusts in the country as there were a generation ago. This leads us to a consideration of the disadvantages of the trust.

Disadvantages. The fact that many trusts, notwithstanding the economies that they were able to realize, lost their monopolistic position in the industry, justifies the conclusion that there are certain factors that act as an offset to the economies, and that tend to make the trust an actually less efficient business unit, particularly when viewed over a long period of time. These countervailing factors may be classed under five heads:

(1) The failure to secure the high order of administrative ability that is required to manage a business of the dimensions and ramifications of the trust. This failure may have been due to the scarcity of such individuals, to their unwillingness to serve as salaried officials, or to errors in judgment on the part of those responsible for their selection.

(2) The failure of the trust to enlist the best services of its leading officials. These men had frequently been the managers of independent undertakings prior to the formation of the trust, but once the trust was formed, they became salaried employees.

(3) The tendency of monopoly toward stagnation. The trust, having a monopoly, is perhaps less likely to apply new inventions or to adopt improvements that necessitate the scrapping of expensive plants and equipment.

(4) The additional financial outlays to which trusts are subjected, including an elaborate and expensive system of control and supervision, the purchase of antiquated and inefficient plants in order to stave off competition, and the purchase of aggressive and successful competitors.

(5) The burden of a highly centralized administrative machinery that deadens the enthusiasm and initiative of the subordinate officials.

Trust Legislation. The legislative policy of the United States is based on a conviction that trusts are bad. The Federal government and most of the states have laws forbidding monopolistic combinations of capital. The first Federal law was the Sherman Anti-Trust Act, passed in 1890. This act forbade every contract, combination in the form of trust or otherwise, and conspiracy in restraint of interstate or foreign commerce; and every monopoly or attempt to monopolize.

During the first decade following the passage of this act, very few suits were brought under it, mainly because of the lukewarm attitude of the Attorney-Generals of the United States who were charged with its enforcement. But the formation of many trusts in the period following 1898 changed the situation. During the administrations of Roosevelt, Taft, and Wilson, numerous proceedings were instituted, attacking the legality of practically all the leading trusts and combinations. A number of trusts were found by the courts to be illegal, and their dissolution was ordered. Among these were the Standard Oil Company (1911) and the American Tobacco Company (1911). Other trusts did not permit the proceedings against them to come to a conclusion, but consented to a decree forbidding them to do certain

things that the government regarded as objectionable. Though certain trusts still remain intact, industry at the present time is not under the control of industrial monopolies to the extent that it was before the Sherman Act was actively invoked against offenders.

The Sherman Act was supplemented in 1914 by two other legislative measures. The first created a Federal Trade Commission, of five members, with power to conduct investigations and to issue orders forbidding the employment of unfair methods of competition in commerce (for further details, see **FEDERAL TRADE COMMISSION**). The second (the Clayton Act) dealt with local price discrimination, tying contracts, holding companies, and interlocking directorates, the purpose of this act being to reinforce, by specific prohibitions, the provisions of the earlier legislation intended to preserve competition in industry.

The creation of the Federal Trade Commission, with authority to prevent unfair methods of competition, constitutes a forward step of great importance. Unfair methods of competition, by receiving condemnation at the hands of a government agency, have come increasingly into disfavor, and competition has been placed upon a high plane. E.J.

TRUST COMPANY. See **BANKS AND BANKING** (Trust Companies).

TRUSTEE, *trus te'*, a person or a corporation to whom the management of property is legally committed. A trust may be created by will, by deed, or by oral statement, but trusts affecting real estate must be in writing. One named as trustee may decline to accept, but once having undertaken a trust, he cannot release himself unless the deed contains a provision enabling him to do so, or a competent court grants such discharge, or permission is given by all persons interested. A trustee must keep account of all moneys, collect debts, keep funds properly invested, and render an account at stated times to the beneficiaries, or those for whom he is acting. He also is liable for consequences arising from his violation of orders of the court, or wrongful uses of trust funds; misappropriation of funds is punishable as one of the statutory forms of embezzlement. Trust companies and banks, as well as individuals, may act as trustees of estates.

In England the office of public trustee was created by act of Parliament in 1906. This officer, under the act, is a "corporation sole," with perpetual succession. He may, if he thinks fit, act as the administrator of estates of small value, as a custodian trustee or as an ordinary trustee; and the law of trusts generally is applicable to him.

Village Trustees. An incorporated village has its legislative department, called *board of trustees*, comparable to the city council, common council, or board of aldermen of a city, or to the legislature (or general

assembly) of a state. This board consists usually of six members, elected for terms of two or three years; the local laws enacted by them are called *ordinances*.

TRUSTIES. See PRISON (Prison Reform).

TRYPANOSOMES, *trip' ah no sohmz*. See ZOOLOGY (How Zoölogy Affects Human Welfare); TSETSE FLY.

TRYPANOSOMIASIS, *trip ah no so mi' ah-sis*, the technical name for African sleeping sickness. See SLEEPING SICKNESS.

TRYPARSAMIDE, *trip ahr' sah mide*, a remedy for sleeping sickness (which see).

TRYPSIN, *trip' sin*. See PEPTONES; PANCREATIN.

TSANA, *isah' nah*, an Abyssinian (Ethiopian) lake. See AFRICA (Rivers and Lakes).

TSANPO, *isahng po'*, RIVER, the name by which the Brahmaputra River is known in Tibet (which see).

"TSAR KOLOKOL," the largest bell in the world. See BELL (Famous Bells).

TSCHAIKOVSKY, *chi kawf' ske*, PETER ILICH (1840-1893), one of the greatest Russian composers, was born at Votkinsk, in the Ural district. He was educated for the profession of law, and was employed for a time in the Department of Justice in Saint Petersburg (now Leningrad), but developed an unsuspected love for music, which led him in 1862 to enter the newly established Conservatory of Music at Saint Petersburg. Here he studied under Zarembo and Anton Rubinstein, who encouraged him to take up music as a career. Tschaiovsky was appointed professor of harmony at the Moscow Conservatory in 1866, and during the next few years he labored diligently as teacher, composer, and musical critic. His first compositions received little favor, and a brief, unhappy marriage, contracted in 1877, further discouraged him to such an extent that at one time he attempted suicide by standing in the icy waters of a river, but was nursed back to health by his brother.

After a period of relaxation in travel, he had a real success in 1879 with his opera *Eugene Onegin*. About the same time, his *Concerto in B Flat Minor* was played in Boston by Von Bülow, and won high praise. Tschaiovsky lived mostly in retirement thereafter, though he continued to compose and produce symphonies and operas up to the year of his death,

when the famous *Pathetic Symphony*, his sixth, was first performed. From 1887 he made concert tours to Berlin, Paris, and London. In 1891 he visited the United States, and at the dedication of Carnegie Hall, New York, conducted some of his own compositions. His reception everywhere outside of Russia was enthusiastic. He died of cholera in Saint Petersburg, at the age of fifty-three, a few days after the production of the *Pathetic Symphony*.

Summary of His Work. The melancholy of Tschaiovsky's nature is often reflected in his compositions, which show great originality and are at times highly emotional. Russian phrases and melodies occur over and over again, and his work is distinctively Slavic, tragedy being a predominant feature. His contrast of tone colors is especially Slavic. His compositions include symphonies, concertos, operas, orchestral fantasies, overtures, ballets, pieces for the piano, vocal duets, and songs. Of outstanding merit are his fantasies—*Manfred*, *Romeo and Juliet*, *The Tempest*, and *Francesca da Rimini*. His *Fifth*, *Fourth*, and *Sixth* (the *Pathetic*) symphonies are among the greatest examples of that form of music, and some of his songs are exquisite.

TSETSE, *tset' se*, FLY, a two-winged fly that transmits the animal parasites which cause African sleeping sickness. There are several varieties of this disease, each produced by a particular species of parasite, but the parasitic organisms, called *trypanosomes*, all belong to the same genus. There are about twenty species of tsetse fly, some of which, however, do not attack man. These flies somewhat resemble house flies, but are a little larger, and they fold their wings over their backs in such a way that the ends do not project, as do those of house flies. The tsetse fly is equipped with a long proboscis, which it uses to pierce the skin of its victim. The flies suck the blood of mammals, including wild game, cattle, horses, and man, and they transmit to cattle and horses a deadly disease called *nagana*. This disease and sleeping sickness are spread in much the same manner as malaria. The insect bites an infected animal or person, and transmits the germs by biting an uninfected victim. The germs do not become infective until they reach the salivary glands of the flies, but the hosts are capable of transmitting the parasites for at least ninety-six days.

The future settlement of large sections of tropical Africa depends upon the outcome of the campaigns being waged against the fly and the disease (see SLEEPING SICKNESS, for information regarding control of the disease). Fortunately, the female insect does not lay eggs, and the flies breed slowly, producing one larva at a time. The larva is deposited on the ground, where it speedily conceals itself in some shady place and turns to a pupa. Both sexes are active bloodsuckers. The species that is chiefly injurious to man lives along lake shores or river banks where there is a dense



Photo: Brown Bros

TSCHAIKOVSKY



THREE VIEWS OF THE TSETSE FLY

forest growth and underbrush. In the Lake Tanganyika district, efforts are being made to kill the pupating larvae by burning grass and brush. In some regions, dummy animals are used as decoys, and black boys are hired to kill the flies, which are sluggish insects. Killing off the wild animals which harbor the germs, and draining the swamps and marshes where the flies breed, have been considered, but it is hardly practicable to carry out these plans on a large scale.

An international commission of scientists, organized through the recommendation of the League of Nations, is making a study of the problem. W.J.S.

Classification. Tsetse flies belong to the fly family *Muscidae*. *Glossina palpalis* is the species chiefly responsible for the spread of sleeping sickness, while *Glossina morsitans* is responsible for the Rhodesian forms of that disease, and is also the principal carrier

of the germ that causes the *nagana* disease among domestic animals.

TSINAN, *tsih nahn'*. See SHANTUNG.

TUAREGS, *twah' regz*. See BERBERS.

TUBE. See SUBWAY.

TUBER. See BULB.

TUBERCULOSIS, *tu bur ku lo' sis*, **PHTHISIS**, *thi' sis*, OR **CONSUMPTION**, an infectious disease, sometimes called the *white plague* because of its prevalence and virulence. It causes about one-tenth of the deaths in the human family. The disease occurs in several forms, but the one in which the lungs are affected is the most common. No age, race, or sex is immune from tuberculosis attacks, and its ravages are so serious that, in several countries, associations for the study and prevention of the disease have been formed. On the other hand, there has been a steady decline in the death rate in various parts of the world for



Photos: U & U

FIGHTING THE "WHITE PLAGUE"

There are many sanitariums such as the above that are maintained to treat by the most modern methods those who have become afflicted with tuberculosis. This one is at Naperville, Ill., a suburb of Chicago.

nearly a century. It is generally agreed that the falling death rate within more recent years is due in considerable degree to modern methods of prevention and control, based on newer knowledge concerning tuberculosis and its cause. It is also an accepted theory that the human race has gradually been building up a resistance to the disease through a process of natural immunization. The people who harbor the germs of tuberculosis are much more numerous than those that acquire the disease. Mild and repeated infections, not developing virulently, would tend to create immunity. These statements, however, are not meant to undervalue the importance of modern preventive measures. The application of these, aided by immunization, inspires hopes that, within the present century, tuberculosis will cease to be an important factor in human mortality.

Cause. Tuberculosis is caused by a specific microorganism isolated in 1882 by the famous German bacteriologist, Dr. Robert Koch. It is a minute, rodlike parasite of vegetable origin, $\frac{1}{8000}$ of an inch in length. Besides the human variety of the tubercle bacillus, there are other types designated as cattle, or *bovine*, and bird, or *avian*. Children are especially susceptible to the invasion of the bovine tubercle bacillus. The carrier in such cases is milk from tubercular cows, but it is safe to drink milk that is pasteurized. The bacilli multiply with great rapidity in the tissues they invade, causing the formation of groups of cells called *tubercles*. In resistant subjects, a hard tissue forms around the germs, rendering them inactive. In persons who suffer both infection and disease, the

tubercles rapidly disintegrate into the characteristic ulcers and cavities of tuberculosis.

Transmission. Lung (pulmonary) tuberculosis is by far the most prevalent type of the disease, and the usual source of infection is the sputum of actively sick persons. Countless tubercle bacilli are contained in the sputum and are ejected through coughing, sneezing,

and spitting. When dried and carried through the air as dust, or in the form of minute drops, sputum is an important germ-carrier, especially in homes, conveyances, public halls, and other enclosures. Out-of-door dust is less dangerous, because sunlight is a destroyer of the bacteria. Sputum deposited on handkerchiefs, clothing, towels, furniture, carpets, and other objects is what sanitarians call "dangerous dirt." Carelessness in this respect has caused many a small child, playing about a room, to become infected, though the infection may not develop actively until years later. A great many cases of tuberculosis in adulthood are the result of infection in childhood. There is also some transmission through contaminated food and water. Milk as



Photos: U & U

THERE IS HOPE FOR THESE YOUNGSTERS

The three children shown above have tubercular bones. In addition to danger to life, there is a possibility that one leg or arm will become shorter than the other. To prevent such developments, weights are attached to the limb which appears to be shortening. The constant pull tends to maintain proper length. Note the weights over the foot of the bed in the upper illustration.

a carrier has already been mentioned (see MILK).

Whether the bacilli enter the body by way of the mouth or nose, focal areas are established, possibly in the tonsils or the larynx, and from these poison centers the germs are carried in the blood circulation to sites of infection, notably the lungs. The larynx often becomes infected from the lungs. When the tubercle bacillus attacks the skin, finding entrance through a cut or scratch, the disease is known as *lupus*. *Scrofula* is tuberculosis of the lymph glands.

Symptoms and Control of Lung Tuberculosis.

This disease has two principal forms—acute and chronic. The acute variety is called quick, or galloping, consumption. An attack begins suddenly with chills, fever, rapid pulse, pain in the chest, cough, labored breathing, and lung congestion. These symptoms increase in severity, and death ends the attack in from four to twelve weeks. There is no cure. Chronic tuberculosis is the type that affects by far the greater number of tubercular persons. This form begins with a dry cough, slight rise of temperature toward evening, declining appetite, and a feeling of lassitude. If the disease is not checked, the cough becomes chronic and very annoying, and a yellowish or whitish sputum is raised. This is sometimes colored with blood. Other symptoms are night sweating, pain in the lungs, constant fever, which is especially high late in the day, and emaciation. Sometimes, quantities of blood are raised from the lungs during a spell of coughing. Death may occur unexpectedly from hemorrhage or exhaustion.

Though no specific has as yet been discovered for the cure of tuberculosis of the lungs, much can be done through treatment along hygienic lines. Many cures have been effected by removal of the patient to a dry, bracing climate, where the temperature is even and sunny days are numerous. Much emphasis is placed by modern authorities on the value of sleeping and living in the open, and of eating nourishing food. The ideal place for a tubercular victim is a sanitarium in a healthful locality. In all cases, the earlier the diagnosis and start of treatment, the better are the chances for recovery.

Prevention. The problem of prevention involves several factors. One of these is early diagnosis, which not only helps the patient, but enables him to keep from infecting others. Thorough physical examination in suspected cases, especially where there is constant fatigue, is important. A valuable aid in establishing the diagnosis is the tuberculin test. A very small dose of tuberculin is injected into the skin, and in tuberculous patients there is a definite reaction within a few hours, manifested by rise in temperature, rapid pulse, chills, and other characteristic symptoms. Persons not tuberculous experience little or no discomfort. Discovery and arrest of tuberculosis before it reaches the open stage, in which sputum is emitted, may prevent any number of infections.

In case of persons actively sick, sanitary disposal of the sputum is all-important, and so, too, is scrupulous care on the part of every patient. All objects which the patient uses or with which he comes in contact should be disinfected, boiled, or destroyed. A tuberculous person should have separate toilet and table articles, and should sleep alone. Especial

care should be taken to prevent the uncontrolled exposure of children. No child should live in the same rooms with an open case of tuberculosis. All milk consumed by children should be pasteurized. All milk products should be made from pasteurized milk. All milk used should be from cows proved free from tuberculosis by the tuberculin test. Children should be especially protected against those dusts which contribute to consumption. These are dust from houses occupied by consumptives, metal dusts, sand dusts, and dusts from granite and sandstone. While adults are greatly endangered by exposure to these dusts, they are even more harmful to children.

These measures help to prevent the spread of actual disease. There is another line of prevention which emphasizes the importance of building resistance. In the article **LIFE EXTENSION**, in these volumes, the reader will find many valuable suggestions on the upbuilding of a healthful, germ-resistant body W.A.E.

Related Subjects. The reader is also referred in these volumes to the following articles:

Bacteria and	Lupus
Bacteriology	Sanitary Science
Disease	(with list)
Health Habits	Scrofula

TUBEROSE, *tube' roze*, a garden or hot-house plant of the amaryllis family, which has been described as "a lump of cloying sweetness." It is not related to the rose, but is allied to the Mexican agaves, the name being a corruption of the adjective *tuberosus*. At one time, the flower was extremely fashionable, but because of its heavy, almost sickening fragrance, it is now less frequently used. The slender stem, often three feet in height, springs from a tuberous rootstock, and bears clusters of funnel-shaped, waxy-white blossoms at the top, and, at the base, six or eight sword-shaped leaves. A native of tropical America and Asia, the flower is now cultivated extensively in France, Italy, and Switzerland, at the Cape of Good Hope, and in North Carolina and New Jersey, for perfumes and toilet preparations. In the factories



DOUBLE PEARL TUBEROSE

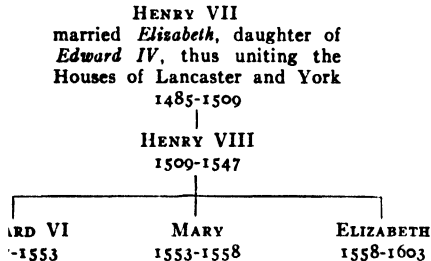
at Grasse, France, 80,000 pounds of tuberoses are used annually for this purpose. B.M.D.

Scientific Name. The tuberose belongs to the family *Amaryllidaceae*. Its botanical name is *Polygonum tuberosa*.

TUCSON, *too sahn'*, ARIZ. See ARIZONA (back of state map).

TUCUMAN, *too koo mahn'*, a city in Argentina. See ARGENTINA (The Cities).

TUDOR, the family name of an English royal house, or dynasty, whose reign, extending from 1485 to 1603, was a period of almost absolute royal authority. Most of the feudal nobility had been destroyed during the Wars of the Roses, but after the union of the two opposing royal houses by the marriage of Henry VII, head of the Lancastrian house, to Elizabeth, the daughter of Edward IV and heiress of the House of York, the great body of the people were glad to have peace at whatever sacrifice. Thus the king ruled with an iron hand, forcing all factions to obey a common central law, and a greater national unity was established than had existed for many years, continuing down through Elizabeth's reign. On the death of Elizabeth, the succession passed to James VI of Scotland, first of the House of Stuart, who reigned as James I. The following table gives the dates of the reign of each of the Tudor sovereigns:



Related Subjects. The reader is referred in these volumes to the following articles:

Edward (VI)	James (I)
Elizabeth	Mary (I)
England (The Religious Struggle)	Plantagenet
Henry (VII and VIII)	Roses, Wars of the
Lancaster, House of	Stuart, House of
	York, House of

TUDOR STYLE, that style of English architecture which prevailed during the period of the Tudor sovereigns, between 1485 and 1603. It was a late phase of the so-called Perpendicular style, a form of Gothic which was characterized by straight lines. During the reign of Henry VIII, the mansions of the gentry and nobility were built on a quadrangular plan, with an inner and a base court and a gatehouse between them. Turrets, decorative chimneys, and bay and oriel windows were popular. Late in the period, the Elizabethan phase of the Tudor style developed; some of the country homes built at this time may still be seen in

England. Characteristics of the Elizabethan style are great square windows, numerous fireplaces and chimneys, carved wooden staircases, gables, eight-sided turrets, projecting bay windows, paneled ceilings, and detailed ornamentation.

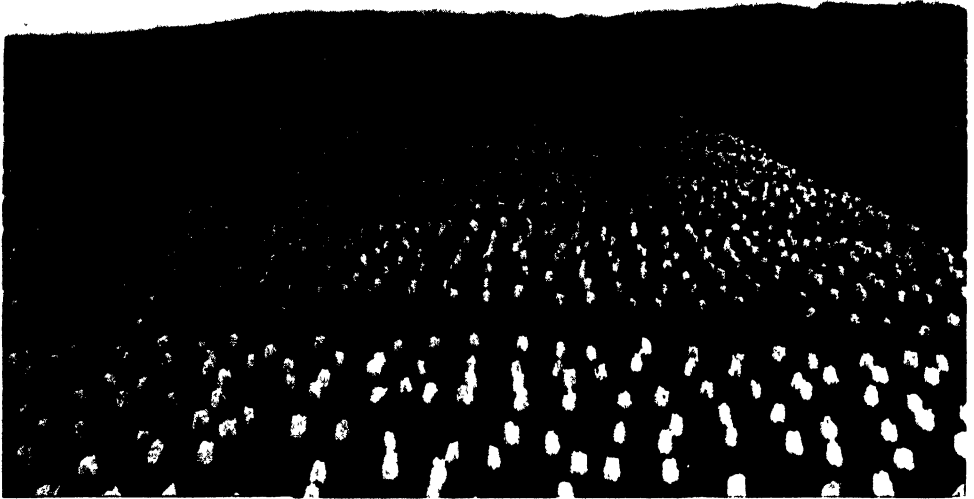
TUESDAY, the name of the third day of the week, is derived from *Tiu*, or *Tiw*, Anglo-Saxon form of *Tyr*, name of the Norse god of war. He was the son of Odin, or Wodin, to whom the day of Wednesday was sacred. The French name for Tuesday is *Mardi*, derived from *Mars*, name of the Roman war god. In the Church calendar, *Shrove Tuesday* (which see) is the Tuesday before Lent. It was so called because confessions were made especially on that day, and the priest *shrived*, or *shrove*, the penitent; that is, gave him absolution. The custom continues in the Catholic Church to this day. See WEEK.

TUFA, *too' fah*, a porous rock formed by the waters of mineral springs. These waters hold carbonate of lime in solution and deposit these substances on evaporation, forming *calcareous tufa*. Tufa is a coarse rock with a cellular structure, and often contains twigs, leaves, or mosses, around which it has formed. The name is also incorrectly applied to dust, ash, or sand thrown out by volcanoes and compacted into rock, which is more correctly called *tuff*. A.J.

TUGALOO RIVER. See SAVANNAH RIVER.

TUILERIES, *tweel' re*, or *twe' lur iz*, a famous royal palace, which stood on the right bank of the Seine, in Paris. It was named from the tile works that had formerly occupied the site. In 1565 Catharine de' Medici began the building, which was originally a great circular structure, surmounted by a dome. Later rulers of France made alterations in the plan, changing the central pavilion to a square, and adding north and south wings and a gallery which connected the palace with the Louvre. Few events of historic importance took place in the Tuileries before 1789, when Louis XVI and his family were forced by the Revolutionary mob to take up their residence there instead of at Versailles. It was there that the Swiss Guards were slain three years later, and there the Convention for a time held its sessions. It was the home of Napoleon, and continued to be the royal residence after the Restoration. In 1871 the palace was almost entirely destroyed by the Communists, but the garden of the Tuileries (about seventy-five acres) is still a favorite pleasure resort. See PARIS.

TULANE, *tu layn'*, **UNIVERSITY OF LOUISIANA**, THE, one of the largest institutions of higher education in the South. It is located in New Orleans. The organization evolved from the Medical College of Louisiana, one of the first medical schools of the country, established in 1834. Out of the medical school



developed the University of Louisiana, chartered in 1845. The present Tulane University dates from 1882, when Paul Tulane, a merchant of New Orleans, donated the first installment of a \$1,050,000 gift, to be used to strengthen the existing university.

In 1884 the name Tulane University of Louisiana was adopted, and a contract was made between the state and the administrators, whereby the Tulane Educational Fund would be used to support the university. Later, a gift of \$100,000 from Mrs. Josephine L. Newcomb, increased by her will to \$3,000,000, established the H. Sophie Newcomb Memorial College for women. Among other departments of the university are the colleges of arts and sciences, law, commerce and business administration, technology, and medicine, the latter comprising schools of dentistry, hygiene and tropical medicine, and pharmacy. The faculty numbers about 435, and the student enrollment is over 4,000. See LOUISIANA (Education).

TULARE LAKE. See CALIFORNIA (Waters).

TULIP. Of all garden flowers, none are more colorful and graceful than the tulips. Their charm is enhanced, too, by the fact that they bloom in the spring, ahead of nearly all the



Photos: O R O C; Visual Education Service

A TULIP FIELD

Heralds of Easter and approaching spring-time wave their heads in the wind. Tulip fields are a glory of Holland, colored in pink, blue, lilac, white, and yellow, the whole resembling some rich Oriental carpet. Below, the form of the flower.

other cultivated flowers. Anyone enjoying a display of these lovely blooms in park or garden would quite agree with the poet James Montgomery, when he wrote of tulips:

Not one of Flora's brilliant race
A form more perfect can
display;

Art could not feign more simple
grace

Nor nature take a line away.

Tulips constitute a genus of the lily family. There are about forty-five species, most of them being native to Southern Europe and to the warm regions of Asia. Nearly all cultivated varieties are derived from a species, native to Asia Minor, that was brought to Vienna from Constantinople in the sixteenth century. The very name is of Turkish origin, and means *turban*.

Tulips grow from bulbs. The leaves spring directly from the bulb, and the flower stems, which are from three inches to over two feet in height, end usually in a single, large, bell-shaped flower, though sometimes there are two, three, or four in a cluster. The flowers are single or double, and usually grow erect on the stem. Their coloring is infinitely varied; some blossoms are of a single color, some have combinations of rose shades, some have gorgeous parrot hues.



Photos: Visual Education Service

THE TULIP TREE

At left, the appearance of the blossoms; at right, the form of the tree

Tulip plants are usually grown from bulbs planted in autumn for spring blooming. They require a well-drained, loamy soil of average richness. As a rule, only professional growers or experimenters grow tulips from seed, as it takes from three to seven years to obtain a flowering bulb, and after a few seasons, the blossoms tend to change materially in color.

After the introduction of the tulip into Europe, it became the flower of fashion both in England and in Holland. In the latter country, between 1634 and 1637, interest in the new plant developed into a craze. Individual bulbs sold for fabulous prices; many persons were financially ruined by wild speculation, and the government was compelled to intervene. To-day, tulip cultivation in Holland is an important industry, and millions of bulbs are exported annually, nearly 2,000 varieties being produced by the Dutch growers. Recently, a large number of new species were discovered in Turkestan and introduced into Europe, and tulips of all kinds are now more extensively grown than ever, both in Europe and in America.

B.M.D.

Scientific Name. Tulips belong to the family *Liliaceae*. The species introduced into Europe from Constantinople is *Tulipa gesneriana*.

TULIP TREE, a North American forest tree of the magnolia family, so called because its flowers resemble the tulip. It is found from the New England states west to Wisconsin and south to Florida and Louisiana. The tulip tree attains a height of 80 to 200 feet and a diameter of five to ten feet, and is loved for its shade and its beauty. It bears showy, yellow flowers, each petal marked with a spot of orange, which attracts the bees; and it has smooth, dark-green leaves that turn yellow

in the autumn. The wood, which is easily worked, is used in making boats, shingles, brooms, and wood pulp, and interior finish for houses. *Yellow poplar*, *tulipwood*, and *whitewood* are various names applied to the timber. From the bark, which has a bitter taste, a tonic drug is prepared.

G.M.S.

Scientific Name. The tulip tree belongs to the family *Magnoliaceae*. Its botanical name is *Liriodendron tulipifera*.

TULLIUS. See **SERVIUS TULLIUS**.

TULLUS HOSTILIUS. See **ROME** (The Period of Legend).

TULSA, OKLA., the county seat of Tulsa County, is situated in the northeastern part of the state, on the Arkansas River, fifty-two miles northwest of Muskogee, 120 miles northeast of Oklahoma City, the state capital, and 218 miles by airline southwest of Kansas City. It has been called "the oil capital of the world," on account of its importance in the oil industry, which has caused its rapid growth from a population of 1,390 in 1900, to 72,075 in 1920, and to 170,500 (Federal estimate) in 1928.

The city occupies an area of seventeen square miles, at a point where the old boundaries of the Creek, the Cherokee, and the Osage nations met. An ancient elm, which was the council tree of the Creeks, still stands in Tulsa. In a park of 2,000 acres of timbered land, Mohawk Reservoir, a 500-million-gallon reserve for the city's water system, also serves to supply lagoons, lakes, and watercourses, which make the great recreation ground especially attractive. The water supply comes from a point in the Spavinaw hills, sixty miles east, by means of an aqueduct and by force of gravity alone. This is noteworthy in view of the fact that there is a difference of only ninety

feet between the elevation of the reservoir at the source in the hills and the terminus in Tulsa (see **AQUEDUCT**). The International Petroleum Exposition is held annually in the city.

Transportation. Tulsa is served by the Missouri, Kansas & Texas, the Atchison, Topeka & Santa Fe, the Midland Valley, the Saint Louis-San Francisco, the Oklahoma Union, and the Sand Springs railroads, and by electric railways. It is also on three Federal highways.

Industry. Tulsa is located in a region well adapted to stock-raising and agriculture, especially to the growing of cotton and grain, but its prosperity is chiefly the result of its proximity to natural gas, coal, and oil fields; the Glen Pool oil district is one of the richest in the world. Practically all of the oil and gas companies operating in the mid-continent field have headquarters in the city. Natural gas is largely used in manufacture, which is represented by cottonseed-oil mills, glass factories, and plants for making oil-well supplies. The city also has smelters and refineries. The oil fields in the Tulsa district produce an average of 400,000 barrels of crude oil a day.

Education. The University of Tulsa, which was founded at Muskogee in 1894 as Henry Kendall College, was moved to the city in 1907. Other institutions of an educational nature include a modern Y.M.C.A. and a Carnegie library.

History. For so large a city, Tulsa's history has been remarkably brief, placing it in a class with Gary, Ind., and other so-called "mushroom" cities of North America that are now on a substantial basis of commercial prosperity. White settlement began in 1882, when an extension of the Frisco line was completed to the old Indian trading post. Up to 1900, the settlement grew slowly, and was generally known as "Tulsey town." Oil developments began in 1901, and in 1902 Tulsa was chartered as a city. Eight years later there were 18,182 inhabitants, and between 1910 and 1920 the population was quadrupled. Its later growth is noted above. The city adopted a commission form of government in 1908, and a city plan and regional plan are also in effect.

TUMACACORI, *too mah kah' ko re*, **MONUMENT.** See **MONUMENTS, NATIONAL.**

TUMBLER. See **MOSQUITO.**

TUMBLEWEED, the popular name of various annual plants found in prairie regions. They are so called because they develop rounded tops and in the autumn, when withered, are carried or *tumbled* about by the wind, like great, light balls. As they scatter their seeds about in their travels over the plains, they are considered a pest by farmers and ranchmen. Often they pile up against barbed-wire fences or fill small gullies, and they become a menace in case of prairie fires, as the wind blows them across the prairies in a burning trail. Among the common American tumbleweeds are the so-called *Russian thistle* (*Salsola pestifera*) and a species of the amaranth family. See **THISTLE**. B.M.D.

TUMOR, *tu' mur*, an abnormal growth or swelling of an area of tissue in the body or on the skin. As the term is commonly used, it is applied to harmless or curable growths, called *benign*, and to *malignant* growths, which are dangerous and tend to return after removal. Generally speaking, a malignant tumor is a cancer. Benign tumors may be as harmless as a wen on the body, or as serious as a fibroid tumor in the uterus. There are many kinds of tumors. As a rule, the name of a tumor is determined by the kind of tissue it is composed of, whether connective tissue, muscle tissue, nerve tissue, vascular tissue, or epithelial tissue. The wisest procedure is to have the advice of a competent physician regarding any lump or abnormal growth that becomes troublesome, or tends to grow larger. The causes and treatment of cancer are treated in detail in these volumes under the heading **CANCER**. W.A.E.

TUNA, a variant of *tunny* (which see).

TUNDRA, the name, first applied by the Russians, for the extensive, low-lying, frozen swampy plains of Siberia, Europe, and North America, bordering on the Arctic Ocean. The surface is covered with a dense growth of peat moss, which grows only during the summer months. Only the surface layer thaws out during the short summer. During this period, wild birds and fur-covered animals may be seen, while flowering plants flourish in some parts. The tundra can be crossed only in the winter season. The name and nature of the Alaskan tundra became familiar to Americans during the Klondike gold rush of 1896-1897. See **ALASKA** (Animal and Plant Life). R.H.W.

TUNGSTEN, a hard, brittle, rare metallic element, of great commercial importance. Its chemical symbol is *W*, from *wolfram*, another name for the metal. Among the pure metals, only iridium and molybdenum exceed tungsten in hardness. When added to steel, it gives greater hardness, tenacity, tensile strength, and elasticity; tungsten-steel tools have about five times the efficiency of those made from ordinary steel. Tungsten has the highest melting point of all the metals, 5,976° F. (see **MELTING POINT**), a property that makes it invaluable for use as filament wire in incandescent lamps. It is replacing the more expensive platinum for contact points in spark coils, telegraph keys, automobile vibrators, and similar devices, and is serviceable in the manufacture of X-ray and wireless apparatus. Tungsten compounds are also important. These have a varied use in the manufacture of automobile parts, fireproof cloth, pigments, mordants for use in dyeing and printing, X-ray screens, electric-light bulbs, cutlery, fountain-pen points, dental and surgical instruments, and many other articles. Recently, tungsten beads of rare colors, produced by electrolysis, have been developed in the jewelry industry.

Tungsten is not found native, and occurs in only a few rare minerals, but these are in sufficient quantities to supply the demand. Wolframite is an ore of iron, manganese, and tungsten; scheelite, of calcium and tungsten; wolfram ocher is the trioxide. California has the largest scheelite deposits known. This ore was named for W. K. Scheele, who in 1781 showed that this mineral contained a peculiar acid, which he named *tungstic acid*. Heating the acid with carbon, two years later, he produced metallic tungsten for the first time. The chief tungsten-producing countries are China, Burma, Japan, Australia, Bolivia, and the United States.

T.B.J.

TUNGSTEN LAMP. See ELECTRIC LIGHT.

TUNGURAGUA, *toong goo rah' gwah*. See ANDES (Volcanoes and Earthquakes).

TUNGUSK, *toon goosk'*, a large coal region in Siberia. See SIBERIA (Minerals and Mining).

TUNIC, *tu' nik*, from the Latin *tunica*, a word having several applications, but most closely associated with the dress of the ancient



THE TUNIC

At left, the Doric tunic; at right, above, the Etruscan; below, the Phrygian.

Romans. The Latin tunic was an undergarment worn by both men and women, and was fastened about the waist by a belt or girdle. It was covered by the toga, when worn by men, and by the stola, when worn by women. The tunic of the Romans corresponded to the chiton of the Greeks. Roman senators wore a tunic having two broad stripes of purple down the center (*latus clavus*), while the tunic of the knights had two narrow stripes (*angustus clavus*). Generals celebrating a triumph and magistrates presiding at the games were dressed in the purple toga and a rich and showy gold-embroidered tunic (*tunica palmata*). See TOGA; STOLA.

Tunic, or *tunicle*, is also the name applied to a vestment worn in the Roman Catholic and in some Anglican churches by the subdeacon who officiates at the celebration of the Mass. The term is used somewhat locally to designate the uniform coat of a private in the British army. At the present time, any loose, short garment, fastened at the waist by a belt or girdle and reaching from the neck to some distance above the knee, is called a tunic.

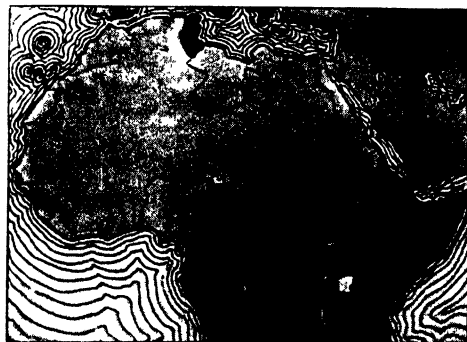
TUNICLE. See TUNIC.

TUNING. See RADIO COMMUNICATION (Glossary of Radio Terms).

TUNING FORK, a steel instrument having two prongs which, when set in vibration, give forth a musical sound varying in pitch according to the thickness of the steel, the length of the prongs, or their distance apart. The ordinary tuning fork sounds only one note, usually middle C or the A above it; the fork which produces the latter note is usually taken as the musical standard, but some are made with a slide on each prong, which, when moved up or down, regulates the pitch of the note produced. The latter are of German construction. Tuning forks may be made for all musical pitches in the audible range, and they are sometimes mounted upon hollow boxes, to increase the volume of sound by resonance. A light blow will set them in momentary vibration. The device was invented in 1711 by John Shore, sergeant trumpeter to George I of England.

TUNIS, *tu' nis*, capital city of Tunisia (which see).

TUNISIA, *tu nish' ih ah*, or *tu nish' ah*, one of the old Barbary states, formerly known as Tunis. Since 1883, it has been under the control of France, having the form of government



LOCATION MAP

This little country, bordering the Mediterranean Sea, is a very small part of the great continent of Africa but is growing in importance.

known as a protectorate. It lies on the Mediterranean coast of Africa, reaching to the most northerly point on the continent. Algeria is on the west; on the south are Libia (Tripoli)



A "BROADWAY" IN TUNISIA

Not many miles across the Mediterranean Sea from a culture in Europe which has been developing for a thousand years lies the city of Tunis, to our eyes almost "a land of make-believe."

and the wastes of the Sahara. Tunisia has an area of about 49,000 square miles, approximately that of the state of Louisiana; its native Mohammedan population, mostly Berber mixed with Arab, was 1,932,184 at the 1926 census; there were 54,243 Jews, and the Europeans numbered 173,281; of these, more than a third are French. There are many Italians, Spaniards, and Greeks. Of the Moslems, some 419,000 are tent-dwellers, 572,000 live in *gourbis*, and 477,000 in houses.

The native government is unopposed by the French in most legal matters, but the highest authority is vested in the French Foreign Office in Paris, which maintains a special department for Tunisian affairs. There is a French Minister Resident-General, and a joint ministry of Tunisians and Frenchmen. The present reigning family has occupied the throne without interruption since 1705. The chief of the native state is known as the sultan; it was the reigning sultan who signed the agreement in 1883 that placed the country under the protection of France.

The northern half of the country is a plateau, and the southern half is a continuation of the Sahara. The plateau region contains the principal river, the Mejerda, and is the chief agricultural district; the southern part is a treeless plain, covered with esparto grass, except in the oases, where there are many date palms.

The fertile area of Tunis has been well developed. About 1,650,000 acres are devoted to wheat, and nearly as many to barley; and there is also a profitable yield of oats. There are many oases and gardens in the south, where over 80,000,000 pounds of dates are produced yearly. About 30,000 tons of olive oil are exported each year from the fruit of nearly 16,000,000 trees, and in the southern region there are 2,250,000 date palms. Other products include almonds, oranges, lemons, henna, and cork.

Stock-raising and mining are other industries of considerable importance. The production of phosphates is increasing every year, and lead, zinc, and iron are also mined in profitable quantities. The coast fisheries employ about 15,000 of the natives, and others engage in fishing, spinning and weaving wool, carpet-weaving, saddle-making, and in the manufacture of matting, slippers, and pottery. The country has over 1,600 miles of railway and over 3,500 miles of good carriage roads.

Tunis, *tu' nis*, the capital city, is situated about three miles from old Carthage, great city of antiquity. It is itself an ancient town, and replaced Carthage politically after the Punic Wars. It is close to the Mediterranean coast, on the Lake of Tunis, which connects with the sea through a channel. The old town is medieval in its aspects, but there is a fine, modern French section. Population, 1926, 185,996, of whom more than half are Moslems.

Other Towns. Of comparatively small importance are Sfax (29,000), Qairwan (23,000), Bizerta (21,000), Qabes (16,000), and Tozeur (12,500).

Related Subjects. The reader who is interested in this discussion of Tunisia may consult the following articles in these volumes:

Barbary States	Date and the Date Palm
Bedouins	Punic Wars
Carthage	Sahara

TUNKERS. See BRETHREN, CHURCH OF THE. **TUNKHANNOCK VIADUCT.** See RAILROAD; BRIDGE (Arch Bridges).

TUNNAGE. See TARIFF.

TUNNEL, *tun' el*, an underground passage, piercing mountains or hills, or passing under the beds of rivers, and made without removing the overlying rock or soil. Engineers once avoided the construction of tunnels because of the expense, but of late years many difficult tunneling feats have been undertaken, in order to straighten railway lines and to lessen running time. Tunnels are considered by engineers as of two kinds—those driven through rock and those excavated in soft earth. Rock offers a tough resistance to tunneling, but it has the advantage of requiring usually no support to the top and sides of the bore. The rock is drilled to form pockets, in which are placed charges of high explosive, which is then discharged by means of an electric spark. The shattered fragments of stone are removed as the work progresses. Four of the greatest tunnels in the world, the Alpine tunnels of Mont Cenis, Saint Gotthard, Arlberg, and Simplon, were blasted or drilled out of solid rock. The work on the Mont Cenis occupied fourteen years. When a tunnel is driven through soft earth or under the mud of a river bed, it is necessary to support the soil above to prevent caving. This is accomplished by supporting the roof of earth with a sheath of timbers or steel, about which cement is poured and allowed to harden. Most tunnels of this kind have a permanent lining.

In the construction of underwater tunnels, the most serious difficulty to be overcome is the inflow of water. Only in cases where the tunnel lies far beneath the bed of the stream is this not a serious problem for the engineer. The situation is met by the use of the compressed-air or the shield system; sometimes the two are used in combination. By the compressed-air method, the pressure of the inflowing water is checked by compressing the air in the end of the tunnel where the work is proceeding. The other system takes its name from the ingenious mechanical device used in the operations. The tunnel shield is a cylinder of steel plate, with the front fashioned to form

a sharp edge. Hydraulic jacks are attached to the inside surface of the cylinder. Their piston rods, as power is applied, press against the lining of the tunnel already completed, and push the cutting edge of the cylinder into the earth yet to be excavated. Near the front of the cylinder is a partition with openings, which the operators may close at will. As the cylinder is forced ahead, the earth is withdrawn in small amounts through the openings. At the rear end, new lining for the tunnel is constructed with each forward movement of the front edge.

In another method of river tunneling, several cylindrical steel sections are first made and sunk in position in the river bed. These are then fastened together, and enclosed and lined with concrete. The subway tunnels laid under the Harlem River for the New York subway were constructed in this manner.

In the course of time, many tunnels are constructed by natural forces. Thus rivers find a course underground; the action of the sea tunnels caves on the coast to an enormous extent; and phenomena such as the Mammoth Cave of Kentucky are due to natural tunneling.

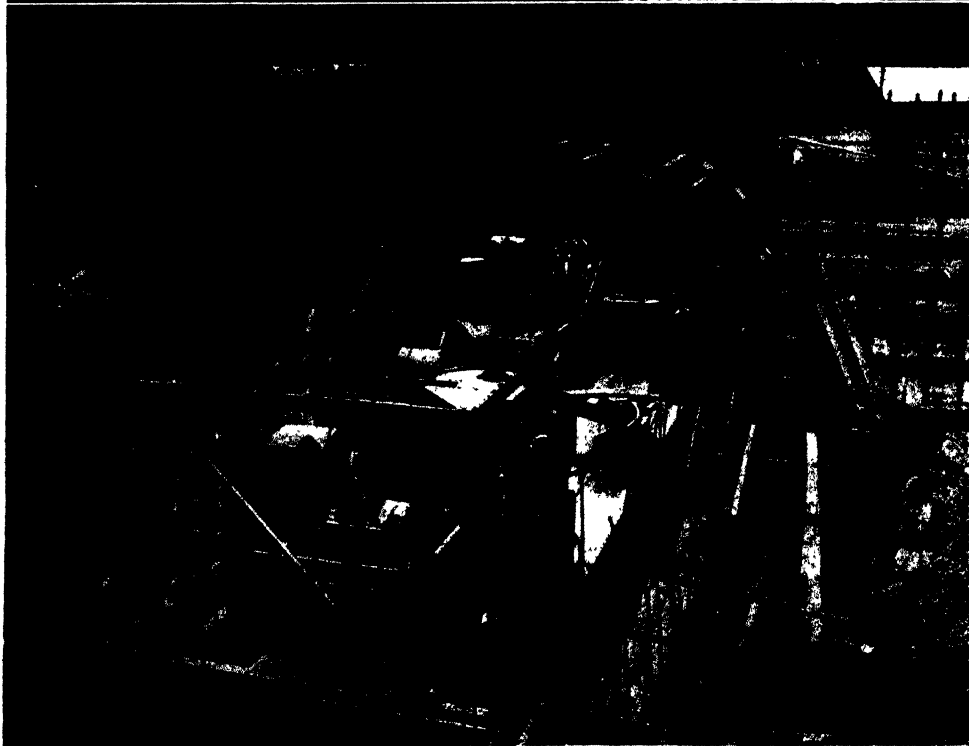
Tunnels have been proposed for undersea connection between England and France, be-



Photo: U & U

THE NATURAL TUNNEL OF VIRGINIA

It is 900 feet long and 400 feet high, and is one of Nature's impressive works. One of the entrances is shown in the illustration.



Photos: U & U

Man-Made Tunnels. Through the bases of great mountains and under broad rivers, engineers push highways that are the shortest distances between two points. The illustrations show tunnels under construction. Above,

neath the Strait of Dover; between the Spanish coast and Northern Africa, beneath the entrance of the Mediterranean at Gibraltar; and even to connect Alaska and Siberia, beneath the icy waters of Bering Strait. Military considerations of national defense have always arisen to block such projects, besides the great cost involved, due to the great length and depth of the tunnels required.

The Cascade Tunnel. See CASCADE RANGE (sub-head).

Vehicular Tunnels. Development of the automobile and motortruck has necessitated the construction in many places of tunnels solely for motor-propelled vehicular traffic. The Holland tunnels under the Hudson River, connecting New York City at Canal Street with Jersey City at Twelfth Street, are notable examples of this class of subterranean and subaqueous construction. These tunnels, opened in 1927, consist of two tubes, each 3,000 yards in length between the portals. Except for the land approaches, they consist of circular cast-iron rings, twenty-nine feet in exterior diameter. Each tube provides for two lines of traffic in one direction only, with a roadway width of twenty feet. The tubes beneath the river were driven with shields under compressed air. Artificial ventilation is provided. About 52,000 vehicles have used the tunnels in a single day, without taxing their capacity. The cost of the Holland tunnels was about \$48,000,000, and tolls are collected.

The River Mersey vehicular tunnel, between Liverpool and Birkenhead, England, is the largest circular-tube tunnel in the world, having an outside diameter of forty-six feet three inches, and an inside diameter of forty-four feet. The main roadway provides for four lines of traffic and two footwalks. The total length of the tunnel is a little less than three miles.

Railroad Tunnels. The nine longest railroad tunnels in the world are listed below:

NAME	MILES
Simplon, between Italy and Switzerland . . .	12.45
Pennsylvania R. R. Tunnel, New York . . .	11.7
Saint Gotthard, between Switzerland and Italy . . .	9.25
Loetschberg, in the Swiss Alps . . .	9.04
Hudson and Manhattan, New York	8.5
Mont Cenis, between France and Italy	7.97
Cascade, between Berne and Scenic, Washington . . .	7.70
Arlberg, between Innsbruck and Bludenz . . .	6.36
Moffat, through the Continental Divide, Colorado	6.11

Related Subjects. In the following articles the reader will find descriptions of various important tunnels.

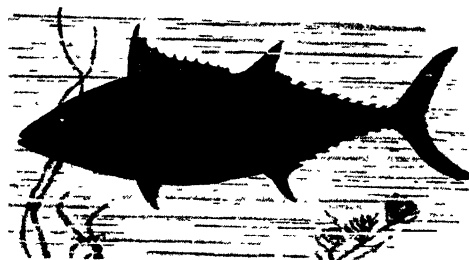
Hoosac Tunnel	New York City (Tunnels)
Hudson River Tunnels	Saint Gotthard
Moffat Tunnel	Simplon
Mont Cenis Tunnel	Subway

TUNNEY, JAMES JOSEPH (Gene). See PRIZE FIGHTING.

TUNNY, OR TUNA, the largest fish of the mackerel family, found in all warm ocean waters. The name *tuna* is the one more commonly heard in America, where the fish is rapidly increasing in favor. The fisheries off the California coast are the most important, especially those along Catalina Island. Because of the large size and the fighting spirit

of the fish, tuna-fishing is regarded as rare sport by anglers who enjoy a stiff fight. These fish sometimes reach a length of over ten feet and a weight of 1,500 pounds, but such giant specimens are rare.

A tunny feeds largely on squid and smaller fish. The body is shaped much like that of the ordinary mackerel, but is thicker; the tail is so



THE TUNNY, OR TUNA

widely forked as to approach the form of a crescent. In Europe the most important fisheries are in the Mediterranean Sea, where the fish are captured in nets. The flesh is sold fresh and in cans; in Italy different parts of the fish are packed separately and marketed under special names. The flesh tastes somewhat like chicken, and is an excellent food. Canned tunny makes a delicious salad. L.H.

Scientific Name. The tunny, called *albacore* and *horse mackerel* on the American Atlantic coast, is known scientifically as *Thunnus thynnus*.

TUOLUMNE, twahl' um ne, RIVER. See YOSEMITE NATIONAL PARK.

TUPELO, tu' pe lo. See PEPPERIDGE.

TUPPER, the family name of two public men, father and son, who were prominent in Canadian history.

Sir Charles Tupper, Bart. (1821-1915), was one of the foremost Canadian statesmen during a long and important period in the development of the Dominion. He was responsible for the adherence of Nova Scotia to the Confederation; later was a member of Sir John Macdonald's Cabinet; then Canadian High Commissioner to Great Britain; and finally, at the age of seventy-five, Premier of Canada. During the closing years of his life, Tupper shared with Lord Strathcona the distinction of being "the Grand Old Man of Canada."

Tupper was born at Amherst, N. S., was educated at Horton Academy, Wolfville, and in 1843 was graduated in medicine from the University of Edinburgh. He began practice at Amherst, and for twelve years was a general practitioner.

In 1855 he entered politics as a Conservative candidate for the Nova Scotia assembly. He was elected, and represented Cumberland County for thirty years, first in the assembly and afterward in the Dominion Parliament, and in 1864 rose to the premiership of Nova Scotia. During the next three years, Dr. Tupper was most active in promoting Confederation, and it was due mainly to his efforts that Nova Scotia joined the union.

In 1867 he resigned as premier of Nova Scotia, and in 1870 he entered the Dominion Ministry as President of the Council; in 1872 he became Minister of Inland Revenue, and in 1873 Minister of Customs, under Sir John Macdonald. Five years later, he became Minister of Public Works, and was knighted. The next year, at his suggestion, the Department of Railways and Canals was created, and he was its first Minister. In 1883 Sir Charles went to London as Canadian High Commissioner, at the same time retaining (until 1884) his position in the Dominion Cabinet. In 1887 he was called back to Ottawa by a crisis in the affairs of the Canadian Pacific Railway, and for a year, as Minister of Finance, labored to place its finances on an easier basis. He then returned to London as High Commissioner, and in the same year (1888) was created a baronet.

He remained in London until 1895, when he was called again to Ottawa, to assume the leadership of the Conservative party as successor to Sir Mackenzie Bowell. Sir Charles became Premier in April, 1896, but the Conservative party was so weakened by internal quarrels and defections of prominent members that it was defeated in the general elections in June. Sir Charles thereupon remained in Parliament, representing Cape Breton, his second constituency, until 1900, as leader of the opposition. He then retired from public life, and afterward resided in England, where he died. He was buried at Halifax. His *Recollections of Sixty Years*, published in 1914, throws interesting sidelights on Canadian political history.

Sir Charles Hibbert Tupper (1855-1927), the son of Sir Charles Tupper, was born at Amherst, N. S., and was educated at McGill University and at the Harvard Law School. His entrance into public life was accidental. In the early stages of the political campaign of 1882, there was a factional fight among the Conservatives in Pictou, N. S. While the deadlock was in progress, both sides consulted young Tupper to see if he, presumably through the influence of his father, could effect a friendly settlement. Neither of the two candidates for the House of Commons would retire in favor of the other, but both accepted Tupper as a compromise candidate. Tupper was elected, and thereafter served in the Commons until 1904. From 1888 to 1895, he was Minister of Marine and Fisheries, and in 1895-1896 he was Minister of Justice and Attorney-General.

In 1893 Tupper was British agent before the tribunal which arbitrated the Bering Sea Controversy. For his services he was knighted by Queen Victoria. In 1896, when his father became Premier, Sir Mackenzie Bowell suggested that the younger Tupper succeed his father as Canadian High Commissioner at London, but the father decided to appoint Lord Strathcona and kept his son in the Ministry as Minister of Justice. Sir Charles Hibbert, after 1897, practiced law at Vancouver, and in 1904 retired from public life.

TURAN. See IRAN.

TURBAN, the name of a headdress, having special reference to that worn by men in Mohammedan countries. This name is of the same origin as the word *tulip*, both being derived from the Turkish *tulband*, an adaptation of the Persian *dulband*, applied to a scarf wound around the head. There are many variations in the style, size, and color, but in general the turban is a scarf of silk, linen, cotton, or other

cloth, folded around the head, or about some sort of a cap. Turbans in Oriental countries show distinctions of rank, profession, and social position. In India, the priests usually wear white headdresses; the native princes wear gaudy and ornamental ones, often pro-



(a) Style worn by Christian priests in Northwestern Asia; (b) Morocco turban; (c) Syrian; (d) turban of citizen of Damascus. In the National State of Turkey the turban is disappearing; the European hat has taken its place (among officials by government decree).

fusely decorated with jewels. In the days before Turkey became a republic and adopted modern dress, its sultan wore a turban containing three heron's feathers, and further adorned with precious stones. Two heron's feathers appeared in the turban of the grand vizier, and one in those of other officers.

From time to time, it has been fashionable for women in Europe and America to wear hats that are a modification of the Oriental turban, some being small, close-fitting, and usually becoming, while others at times have been such as are alluded to in *Cranford*, Mrs. Gaskell's classic of village life:

I was anxious to prevent her from disfiguring her small, gentle, mousey face with a great Saracen's-head turban.

The gaudy headdresses worn by negro women in the West Indies and the Southern United States are also known as turbans.

TURBINE BONES. See FACE.

TURBINE WHEEL, or **TURBINE**, *tur' bin*. The lawn sprinkler, which rotates by the reaction of the air upon the water flowing through holes in its arms, is the simplest type of a turbine wheel. By enlarging the sprinkler and in-

creasing the pressure of the water, a motor might be obtained with sufficient power to run a sewing machine or a coffee grinder, but the waste of water would be so great as to render the motor impracticable. A simple type of turbine wheel, commonly known as a *water motor*, consists of a small wheel with cups on the outer ends of its spokes, and enclosed in an iron case. A jet of water under high pressure strikes against the cups and causes the wheel to rotate. These motors are from twelve to fourteen inches in diameter, and are very successful for operating machines that require but little power. In principle, they are reaction wheels.

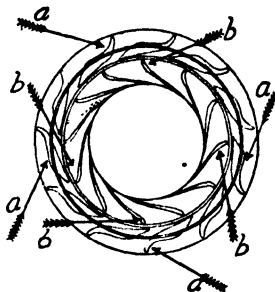


FIG. 1

(a) Blades on the inner surface of the case; (b) blades on the wheel.

The larger turbine used in mills consists of an iron wheel with curved blades, or flanges, on its surface, enclosed in an iron case to whose inner surface blades similar to those on the wheel, but curving in the opposite direction (see Fig. 1), are attached. These turbines may be placed in a vertical or a horizontal position as conditions require, but most of them are horizontal. The wheel is placed several feet lower than the surface of the water to be used as a source of power, and is connected with the water supply by an iron pipe called the *penstock* (see Fig. 2). When the water is let into the penstock, it flows through openings in the case against the blades on the wheel, which is made to revolve by the pressure of the water.

Since the pressure of water is increased by its depth, a wheel fifty feet below its source of water supply will have twice the power of a similar wheel twenty-five feet below the water. Turbines of this type are known as *pressure turbines*, and they utilize ninety per cent or more of the power. Pressure turbines vary in size from a few inches to eighteen feet in diameter. The total capacity of water wheels installed in plants of 100 horse power or more, in the United States, exceeds 11,000,000 horse power. A notable example of the water turbine is the installation in the plant of a power company at Niagara Falls. The turbines are located 150 feet below the surface of the ground. Water is supplied to them through pipes twelve feet in diameter, and then discharged through a tunnel into the river below the Falls. The turbines operate large dynamos which develop electric power. See **NIAGARA FALLS AND RIVER (Water Power)**.

Steam Turbine. The steam turbine is a prime mover which generates motive power in the same manner as the farm windmill; but, instead of a current of air being used to rotate the shaft by means of *sails*, as in a windmill, a current or blast of steam, issuing from a number of fixed nozzles, is employed, by means of *vanes*, *buckets*, or *blades*. It operates on the same principle as the water turbine, except that it makes use of both the direct pressure and the expansive power of steam. The most satisfactory type consists of a series of turbines, each succeeding one being a little larger than the one before it, to adapt the motor to the expansion of the steam. The blades on the wheel and those on the en-

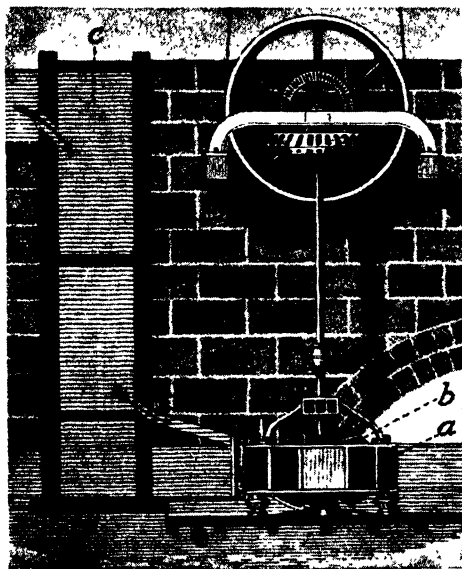


FIG. 2

(a) Case; (b) wheel; (c) penstock.

closing case curve in opposite directions, as in the water turbine. Steam turbines are used for propelling large steamships and for operating large dynamos. See, also, the article **WATER WHEEL**.

TURBOT, one of the largest of the flat-fishes, and one of the species that is of most value commercially. It is seldom longer than two feet, and weighs from eighteen to thirty pounds, although ninety-pound turbot have been caught. It has a very flat, wide body, with a long fin on the top and bottom ridges. Its upper surface is brown and covered with hard, round knobs. The turbot is a sea fish, and its eggs—five or ten million to a fish—float on the ocean surface, but the full-grown turbot prefers a sea bank, where it lies on its lighter side. Both the eyes are on the left side of the body. The turbot abounds off the

western coast of Europe and in the Mediterranean, where it is caught for export. It is the fish most highly esteemed in English cookery. See **FLATFISH; FLOUNDER**. L.H.



However great the dish that holds the turbot, the turbot is still greater than the dish.

—MARTIAL: *Epigrams*.

Scientific Names. The European turbot is *Rhombus maximus*. An American species, the sand dab, or windowpane, *Lophopsetta maculata*, is found on the Atlantic coast.

TURCOS. See **ZOUAVES**.

TURGENEV, *tur gen' yef* (also spelled **TURGENIEFF**), **IVAN SERGEYEVICH** (1818-1883), a Russian novelist, born at Orel. His father had married a rich woman, and the boy was trained for the life of a cultured country gentleman. He was educated in the universities of Moscow and Saint Petersburg (now Leningrad), and under private instructors at Berlin, and knew German and French much better than his native tongue. It was the custom of the day for the aristocracy of Russia to scorn their own language, and Ivan's mother would not use it in her home circle. However, a Russian peasant aroused his admiration for the language and literature of his native land by reciting some early Russian poetry, and the young man began to write for native magazines and newspapers. He lived as a Bohemian until his mother's death, in 1850, made him rich, and he freed his serfs then.

In 1852 Turgenev won praise for *A Sportsman's Sketches*, describing the sufferings of Russian peasants. This book undoubtedly hastened the emancipation of the serfs. *A Nest of Nobles* once more drew a vivid contrast between the aristocracy and the working

classes of Russia, and this was soon followed by works of the same character, *Fathers and Sons*, *Smoke*, and also *Virgin Soil*. Pessimism and realism are never absent from these stories, but their plots are so skilfully woven and their characters so strongly drawn that readers almost forget the tone of sorrow in the work. His last years were spent near Paris, and he was buried in Saint Petersburg.

It was Turgenev who coined, in his *Fathers and Sons*, the word *nihilist* (meaning a man "who bows before no authority, and accepts no principle unproved"), which later figured so largely in all writings about Russia. Accuracy of observation, deep sympathy and understanding, and good characterization are the main features of his writings. He was the first Russian author to be read and admired by Europe, and was especially popular in France.

TURIN, *tu' rin*, the Italian city of **TORINO** (*loh re' no*), lies in a beautiful plain of Piedmont, surrounded by mountains, on the River Po. It is eighty miles northwest of Genoa and seventy-six miles southwest of Milan. In summer, Turin is one of the most attractive places in the north of Italy. On the left bank of the Po are the beautiful parks and botanical gardens, and there are many inviting walks along the stream. On a hill overlooking the city from the east rises the great church of La Superga, now the mausoleum of the House of Savoy. The summit of the hill, which is reached by a cable railway, affords a magnificent view of the city and its surroundings.

Turin is different from most Italian municipalities because of its regularity. The city dates from Roman times, and has been prominent in European history. Hannibal captured it after crossing the Alps, in 218 B.C. It was partly burned down in A.D. 69. From 1861 to 1865, it was the capital of the kingdom of Italy. The royal palace and park still remain. The educational institutions include a university founded in 1405; military schools, an observatory, academy of sciences, and museums. There is a notable collection of arms and armor in the palace, and a library rich in manuscripts.

Turin is a flourishing and important industrial center, particularly for the motor-car and silk industries. It has developed as an important military station, because of the proximity of the French boundary and the Alpine passes. The present population (of city and suburbs) is 520,000. Only Milan, Naples, and Rome surpass it in size among Italian cities.

TURKESTAN, *toor keh stahn'*, also spelled **TURKISTAN**, a name applied to the region in Central Asia extending eastward from the Caspian Sea to the boundary of China, and from the Siberian steppes southward to Persia, Afghanistan, and India. The term was orig-



Photo: Brown Bros.

TURGENEV

inated to designate the lands occupied by the Turkish races, but its significance has been lost, for Turks live in other lands, and other races occupy part of Turkestan. As understood to-day, Turkestan may apply either to the territory in Asia under Russian control, known as Western, or Russian, Turkestan; or to East, or Chinese, Turkestan.

Russian Turkestan extends from the Caspian Sea east to Mongolia and Sin-kiang. On the north it is bounded by Siberia, and on the south by Persia, Afghanistan, and India. It includes two constituent republics of the Soviet Union, Uzbek and the Turkoman, and the autonomous republics of Kazak, Kirghiz, and Tadjik.

Chinese Turkestan, situated in the heart of Asia, extends east from Russian Turkestan to the Gobi Desert and Tibet. It is enclosed between the Tian-shan ranges on the north and the Kuen-lun Mountains on the south. It is now a part of the Chinese province of Sin-kiang (which see).

History. Through this country passed the caravans of early times, bearing the products of trade from the East to the West, and back. Bokhara and Samarkand were rich commercial cities in the sixth century, when they were conquered by the Turks. Following the conquest of Persia by the Saracens, about the seventh century, the country beyond the Oxus River was soon overrun by the Mohammedans, and looted for its riches. In 1073 Malek Shah, sultan of Turkey, annexed Turkestan, and it was numbered among the conquests of Genghis Khan early in the thirteenth century. Timur, the Tartar, a direct descendant of Genghis Khan, became very powerful through his struggles with the petty chiefs in Turkestan, and set up a dominion with Samarkand as his capital. He reigned from 1370 until his death, in 1405. Bokhara and Samarkand were centers of Mohammedan culture during the fourteenth and fifteenth centuries.

The Kirghiz tribes with their two main branches, Kazak, or Cossack (see COSSACKS), and Kara (Black), represented the most disturbing element in Turkestan, and their raids were the constant dread of the more peace-loving tribes. Whether it was the unruliness of the Kirghiz or the ambitions of Peter the Great which caused Russia to adopt a coercive

policy toward Turkestan, is a question. Be that as it may, by 1734 Czarina Anne (1693-1740) obtained the formal surrender of the Kirghiz, though it was almost the middle of the next century before they were in fact subdued. In 1865 Tashkend was stormed and taken; three years later, the same fate befell Samarkand; in 1873 the Lower Oxus, including Khiva, was conquered, and in 1876 Kokand. In 1881 the Tekke Turkomans, one of the most numerous nomad tribes of Turkestan, defended their fortress Geok Tepe, in one of the fiercest battles of the Russo-Turkish campaigns. The capture of this fort was the most important victory of Russia in Central Asia, for it not only overcame the greatest obstacle to further territorial aggrandizement in Asia, but it brought a civilizing influence into a land whose tribes had robbed and murdered at their will, for many centuries. The Chinese were able to prevent any further invasion of Russia into Turkestan, though not without frequent recourse to arms.

At the beginning of the World War, when the races of Turkestan were asked to mobilize to fight for Russia, which they hated as an oppressor, they revolted under the lead of the Kirghiz tribes. They were punished severely for this rebellion, but were never wholly subdued. Following the Russian revolution, the Soviets extended their power into Western Turkestan.

Afghan Turkestan. A considerable portion of the territory long called Turkestan now forms a northern province of Afghanistan, known since 1927 as the Mazar province. It is bounded on the north by the Oxus River and on the northwest by Russian Turkestan. It was long ruled by Uzbek chiefs, but has formed part of Afghanistan since 1859. The northern frontier was the subject of agreements between Russia and Afghanistan in 1873 and 1885. The area of the province is about 57,000 square miles, or almost one-fourth of the total area of Afghanistan. The population is about 800,000, mostly of Persian and Uzbek stock, with some Mongols, Hindu, and Turkoman tribes. The land is rough and mountainous, and agriculture flourishes only in the river valleys, which are well cultivated. Plans for cotton cultivation on a large scale are under way. There are motor roads, telegraph lines, and aerodromes in the province. The chief town is Mazar-i-Sharif, which carries on a large trade in astrakhan (which see) and furs, though it was partly destroyed by fire in June, 1927.

Related Subjects. The reader is referred in these volumes to the following articles:

Genghis Khan	Tartars
Kirghiz	Timur
Russia	Turkoman
Sin-kiang	Uzbek



LOCATION MAP

(a) Russian; (b) Chinese. The borders of Chinese Turkestan are somewhat indefinite.



T The STORY of TURKEY

TURKEY. In an earlier day one of the most powerful countries of the world, whose domain spread into three continents, Turkey is now a minor state. It is important politically only for the reason that, because of its geographical position, it holds a threat to other nations whose interests clash with it. Constantinople, no longer the capital, but an important city in a favored location, is about all that remains to Turkey of its former vast territory in Europe, and it is still Turkish because the powers of Europe dare not face the hazards of wresting it from its ancient ownership.

Not only territorially, but socially and politically, Turkey has changed. No longer do we hear of the *Sublime Porte*, as the Ottoman government was called in the days when the government offices were housed in a building whose entrance gate was very lofty. The sultan, head of the old absolute monarchy and of the Mohammedan faith, is gone; a dictatorial President in a so-called republic, the National State of Turkey, has assumed the place of this rather romantic figure, and the new official group has become strangely apathetic toward the ancient religion. Turkey has turned westward for its inspiration.

On the other hand, the Western world holds various views with respect to this old country. To the commercial mind, it brings thoughts of

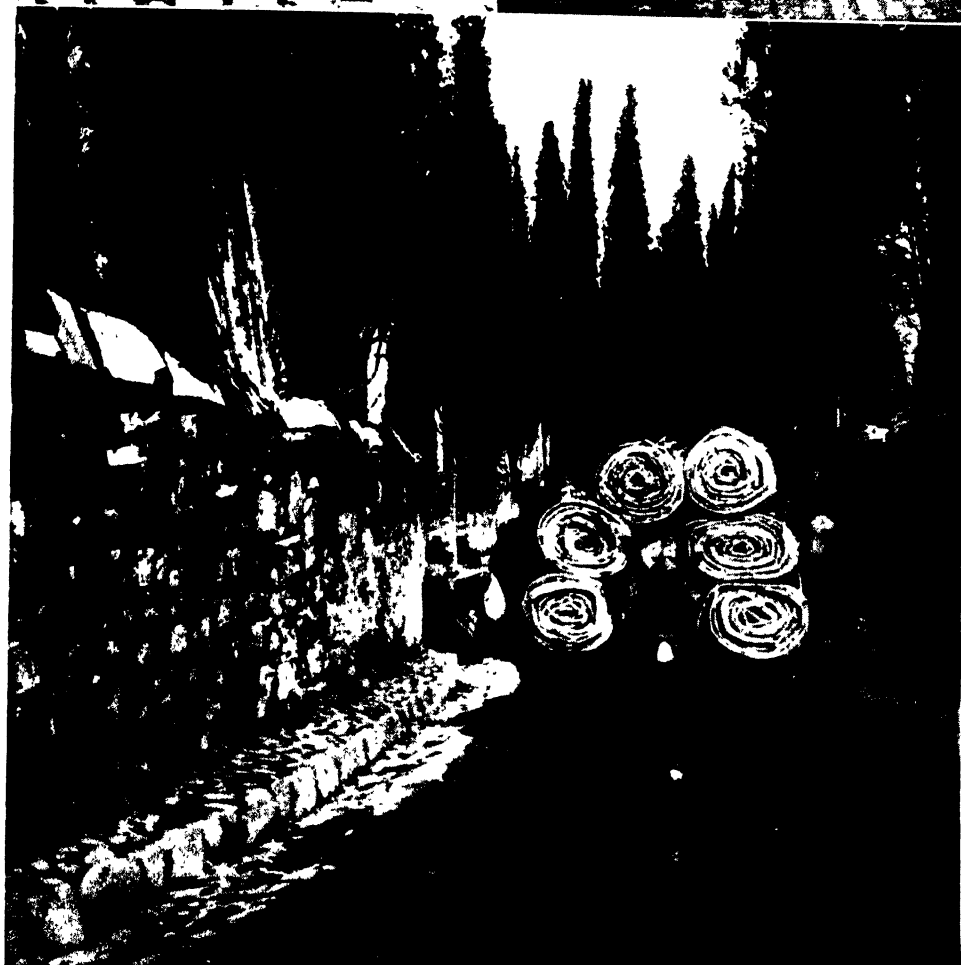
carpets, Smyrna figs, and tobacco; to one given to romance, it is a land where the call of the muezzin drifts out from slender minarets silhouetted against the sky, where golden-tinted domes glow in the noonday sun; to the reader of history, a land of memorable contacts with Greek, Roman, and Persian history: for in the old Turkey, particularly in that part known as Asia Minor, history is traced back many, many centuries, in a long story of conflict between Asia and Europe.

Looking into the Past. In this region called Asia Minor, and in the neighboring lands of Persia, Arabia, and India, the Aryan race probably developed from its Stone Age beginnings. Across it swept many of the barbarian tribes, and within it various kingdoms rose and fell. Phrygians, Lydians, Cimmerians, Gauls (whose descendants in Phrygia were the Galatians of Saint Paul's *Epistle*), Greeks, Persians, Romans, and Turks—all at some time have made it their home.

Who, reading of Helen of Troy, pictures that walled city besieged by the Greek heroes as a mud-walled town in what we know as Turkey? The story of the fall of Troy was, however, the first tale in the conflict between European and Asiatic. In the early days, when the Greek cities flourished, when the Persians retreated in defeat after Xerxes' unsuccessful attack upon Greece, and when the Roman state was powerful, Europe held the supremacy. But when Constantinople fell before the Turks, Asia became supreme. A long, long period has passed, during which Asia and the Turk have ruled, although the European nations have assailed the empire as it gradually weakened—England, Russia, France, Germany, sometimes together, often against one another. Some-

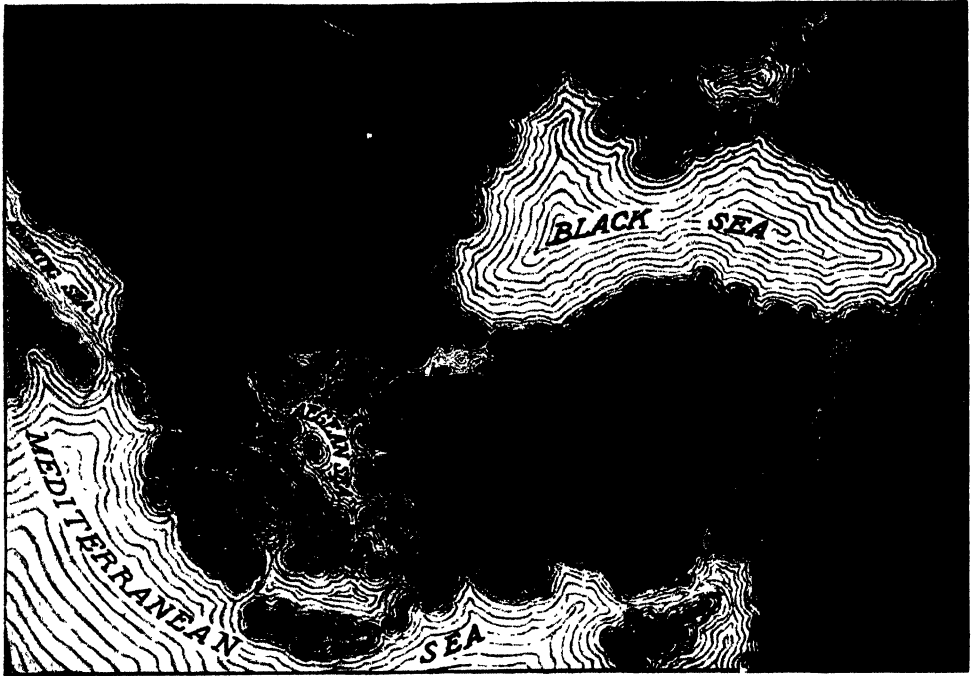


LOCATION MAP



Photos: Keystone

In Present-Day Turkey. Above, at left, a public letter-writer, whose business it is to write for his illiterate customers anything from legal documents to love letters; at right, street merchants in Constantinople. Below, transporting Smyrna rugs to market.



THE EMPIRE IN 1481

The black boundary lines show the limits of Turkey a few years after the capture of Constantinople (1453).

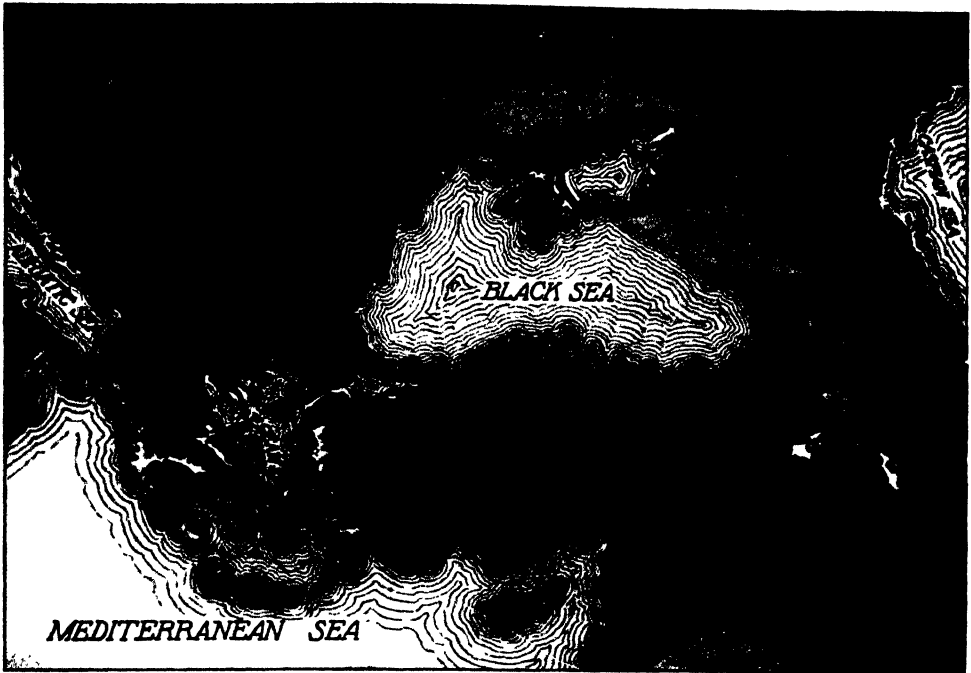
times the Turkish pawn was moved as a guard for the great Indian Empire; sometimes it barred the Russian giant knocking at the Black Sea gateway. Greedily the European powers watched it, whispering that "the Sick Man of Europe," as Czar Nicholas of Russia called Turkey, would soon die and the strategic bit of land be theirs. This hope of the nations never was realized.

Thousands of square miles of Turkey's land have been lost, but "the Sick Man" changed doctors, and now appears to be making a marvelous recovery. In the land where Greek culture once flourished, a new Turkey is being fashioned, one which its builders hope shall take its place beside the European nations. Time alone can prove whether the stage so long set for the conflict of Asia and Europe has been changed.

Area and Location. The Turkish Empire, also known as the Ottoman Empire, was once worthy of the name of empire. To the sultans belonged the European regions of Greece, Macedonia, and the Balkans; in Asia, they ruled over Asia Minor, Armenia, and Kurdistan, Mesopotamia (Iraq), Syria, and part of Arabia; in Africa, over Tripoli and Egypt. Vast and unwieldy, the empire was called Turkey in Asia and Turkey in Europe, to distinguish its regions so widely separated in nationality and location.

Plunged into the caldron of war too often, the vast empire shrank until the present Turkey in Europe consists of the cities of Constantinople and Adrianople, and the small part of Thrace around Adrianople; while all that is left of Asiatic Turkey is the province of Anatolia, or Asia Minor, and Imbros, Tenedos, and Rabbit islands, in the Mediterranean. The African possessions were lost in 1912 and 1915. The total area is estimated at 494,538 square miles, and the population is close to 13,660,000. A thoroughly dependable census never has been taken.

The People. In the years following the overthrow of the Ottoman Empire, a marked change took place in the population of Turkey. The fortunes of war, and the wholesale exchanges of Greeks and Armenians within the republic for Turks living outside the new limits of Turkey, reduced the variety of nationalities once so characteristic of the empire. The aim of the nation to-day is a new Turkey, one and indivisible, a government no longer based upon force and a religion, but welded together by true nationalism and the desire to see Turkey no more "the Sick Man of Europe," no longer the plaything of the powerful European nations, but their equal. To this end, a steady policy of Westernization is being followed in education, social life, laws, foreign policies, and commerce.



BOUNDARIES OF THE EMPIRE IN 1683

The map emphasizes the dismemberment of the Empire, with the dates at which the various provinces were lost.

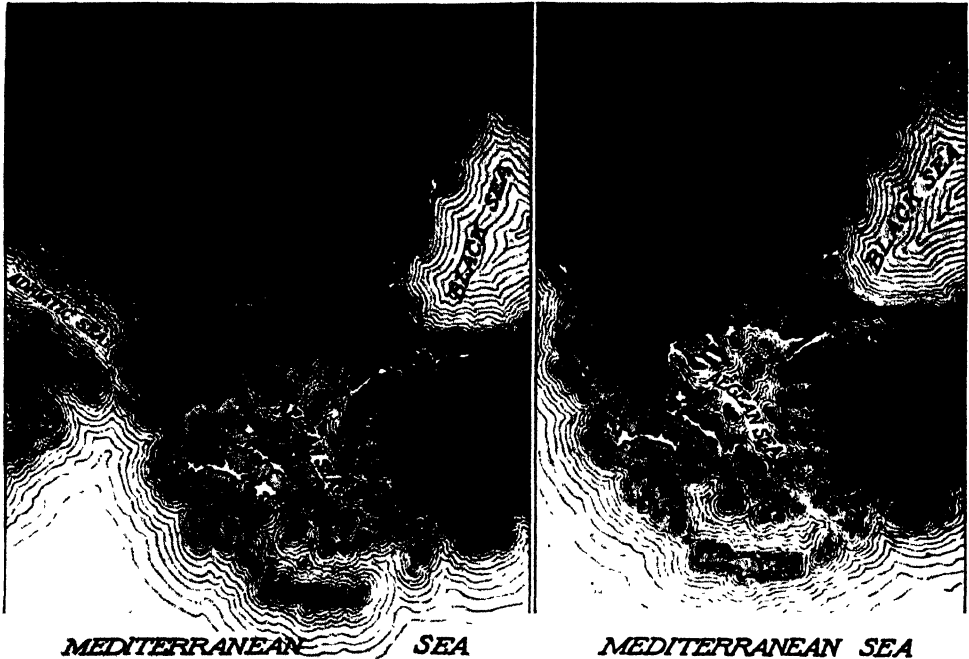
Social Life. Turkish men have laid aside the fez, the red cap so long symbolic of their race. Upon the streets and in the theaters, men and women are seen together. The new status of women is perhaps the most obvious social change. Before the World War, the more intelligent class of Turkish women were already restive; some were attending the foreign schools and there acquiring Western ideas. During the war, many women went as nurses to the hospitals and battlefields, while others filled the positions of men who were at the front.

With the coming of the republic, almost complete freedom has been achieved. The veil is now optional, and about ninety per cent of the women wear European headgear. Upon the streets and in public conveyances, women are free to come and go as they choose. In the universities, in the courts, in offices, even upon the stage, the Turkish women are seen; these are signs of the new spirit in Turkey. It is said by some that this change is but a return to the simple ways of Turkish social life as it was before the decadent influence of the Byzantine Empire was felt.

Religion. Under the republic, religion has been strictly separated from the government. The state-supported schools are not permitted to teach any religion whatsoever. When the office of sultan was abolished by the formation

of a republic, a member of the hereditary family was appointed as caliph, or religious ruler. In 1924, however, Turkey abolished even the caliphate, thus relinquishing the spiritual rule of the Islamic world for the benefits of Western progressive policies. In 1926 legislation suppressed the *Ulema*, persons formerly connected with the official duties of Islam, and considered a separate class. Only an imam, to conduct religious services, remains now for each mosque. No religious propaganda is allowed in the schools, and the compulsory attendance of Moslem pupils at Christian services is forbidden. The Moslem Friday has been abolished in favor of the Western Sunday.

Education. The new republic considers that education of the youth of the country will bring about the most constructive and complete Westernization of new Turkey, and large sums of money are being expended in that direction. The results have been gratifying, for school attendance has more than doubled since 1914. A Minister of Public Instruction has charge of education, and in 1928-1929, more than fifty-four per cent of the Turkish budget was spent for common schools. Education is compulsory in the elementary grades for pupils between the ages of seven and sixteen. Lack of teachers and equipment has been a handicap in some of the more remote



STILL SHRINKING, YET UNABASHED

At left, Turkey's boundaries as fixed by the Congress of Berlin (1878). At right, the Balkan states, showing the limits of European Turkey and the Balkan boundaries after the Balkan Wars (1913).

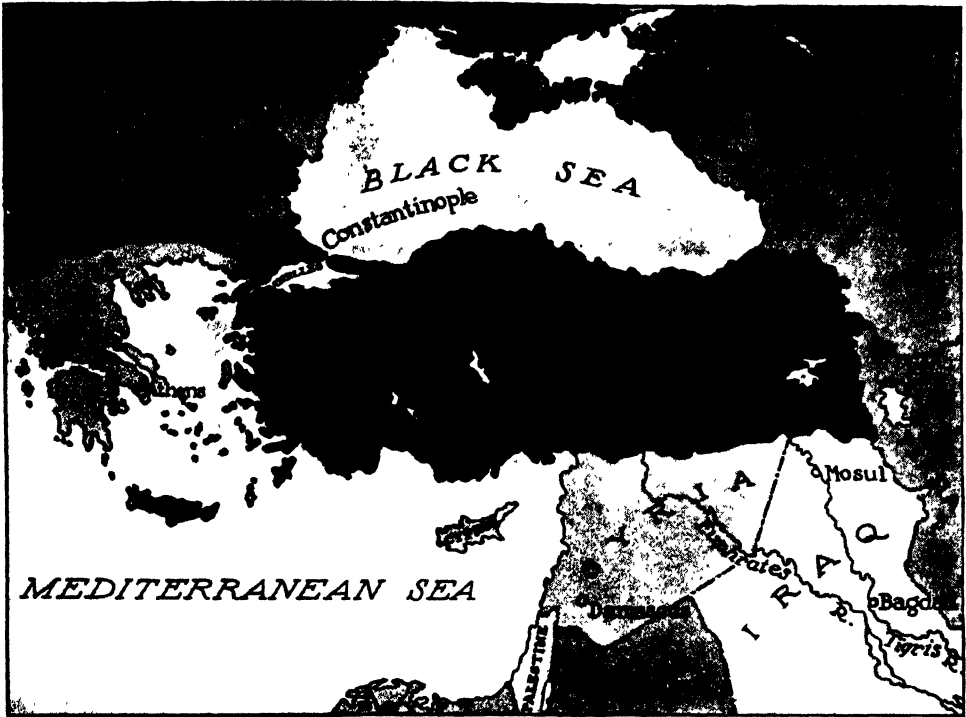
regions, and it has not always been possible to enforce the compulsory-attendance law. Moslem schools, closed in 1924, have been replaced by government schools, consisting of primary and secondary schools, training schools for teachers, and the University of Constantinople. Founded in 1900, the University of Constantinople was reorganized in 1918, and faculties of arts and sciences added. It is coeducational, and is the center of the new intellectual life of the republic. In all the schools, the teaching of Turkish history, geography, language, and literature by Turkish teachers approved by the government is compulsory. Special schools have been organized in which advocates may be trained to administer the new laws; women are being graduated from these schools and taking their places in the courts of the new Turkey.

Before the World War, Americans maintained about five hundred educational institutions, but the greatest number of these are in territory no longer Turkish. Two American colleges in Constantinople, Robert College for men and the Woman's College, are very well known. Robert College was founded in 1863 as part of the New York State University, and was officially recognized by Turkey six years later. Between 3,000 and 4,000 students have been educated there since its organization. Another American college is the International

College at Smyrna. There are many other foreign schools conducted more or less on missionary lines, and all foreign schools are under the same regulations as the private Turkish schools. One of the most far-reaching changes made by the new government was the adoption of the Latin alphabet to replace the Arabic symbols. (See below, *History*.)

The Cities. Foremost among the Turkish cities is Constantinople (since 1929, Istanbul), once a truly royal city, one of the most important on earth, the meeting place of the East and the West. On the Aegean coast is Smyrna (now Izmir); it is 2,500 years old, and at one time was a great cosmopolitan city. Since the greater part of the Turkish republic is in Asia Minor, it is in the cities of this section that future development must come. The more important ones are described below.

Adana, ah' dah nah, thirty miles from the Mediterranean, is situated on the right bank of the Seihan River. It is in the cotton section, and has prospects of becoming an important industrial city. Adana is strategically located, for it commands a passage through the mountains to Syria, on the southwest. A railway connects it with Tarsus. Small boats are able to navigate the Seihan River to Adana. This is a very ancient city, which has been restored at intervals, beginning in the eighth century. It rivaled Tarsus in importance in the days when it was a military post for the Romans. Population, about 100,000.



THE NATIONAL STATE OF TURKEY

Adrianople, (since 1920, Edirneh), is located in the small strip of Turkish territory which, with Constantinople, remains in Europe. It is only a few miles from the boundary of Bulgaria, and is situated where the Maritsa, Arda, and Tunja rivers meet, about 137 miles by rail west and north of Constantinople. Its position, to which was due its once great commercial importance, was responsible for its being the scene of almost constant warfare from 1912 to 1923.

According to historical records, Adrianople was founded by the Emperor Hadrian (A.D. 76-138), on the ruins of an ancient Thracian city. During the Balkan Wars, it was besieged by the Bulgarians and Serbians for six months, and surrendered on March 27, 1913, only to be recaptured four months later. Queerly shaped wooden buildings line the narrow, crooked, alley-like streets. The surrounding country is rich in agricultural products, and fruits are grown, from which some of the finest Turkish wines are made. The principal exports are raw silk, cotton, opium, rosewood, wax, and turkey-red dye. The manufactures are silk, woolen, and cotton stuffs, attar of roses, and leathers. The population in 1905 was about 80,000, but migration of non-Turkish races following the World War has reduced it to about 35,000.

Angora, called by the Turks *Ankara*, *ahn kah' rah*, in the interior section of the new republic, is the centrally located Turkish capital, well fortified by nature and man. Unlike Constantinople, it is not exposed to outside attack or influence. It is located upon a rocky hillside, almost unassailable from the rear, and protected in front by a vast open plain. There is excellent rail and telegraph connection with

Constantinople. Long the seat of the Council of the Nationalist party, it was here that the National Pact, the Turkish Declaration of Independence, was drawn up. After the seizure of the first Assembly at Constantinople by the British, such deputies as escaped made their way to Ankara, where the Assembly was reconvened. Thus Ankara was a natural choice for the new capital, one which should break away from traditions of the old and opposition to the new, which hung so heavily over the city of the sultans.

Once a flourishing city, dating from the third century B.C., Ankara later became an unimportant inland town, with narrow streets and mud brick houses. In the revolutionary changes after the World War, Ankara not only became the capital of a reborn nation, but almost overnight was transformed into a modern city. Plans practically to rebuild the entire city were made by a noted German city-builder, Herman Jansen, and approved by the President of Turkey. The traffic problem, which has harassed so many cities built before motor cars became so numerous, has been solved by providing main arteries with crossings only every five blocks. No buildings face on these highways, and a minimum of stops permits an average speed of sixty miles an hour, without danger.

A large portion of the old city has been torn down, and more than 3,000 new buildings of approved Western style have been erected, many of them fine government buildings, schools, and hotels. Modern drainage and sanitation have been introduced as rapidly as equipment and skilled labor have been procured. Streets have been paved, a power station to supply the city with electric lights has been erected,



SLEEPY ANGORA (ANKARA) BECOMES A MODERN CAPITAL

and many factories with modern equipment have been constructed. In 1925 a telephone exchange and a powerful wireless station were installed. The chief manufacture is mohair cloth, and wool, mohair, and grain are exported. Population, about 108,000.

Brusa, *broo' sah*, is an ancient and very beautiful city near the Sea of Marmora, and might have been chosen as the new capital but for its nearness to the sea, which makes it easily open to attack. It is said to have been built by order of Hannibal. It is a center for the silk-spinning industry. Population, about 127,000.

Konia, *ko' ne ah*, in the south-central section, is an important railway center and the starting point of the Baghdad Railway. Population, about 101,600.

Samsun, *sahm soon'*, on the Black Sea, is an important shipping point for tobacco, the finest variety being raised in this region. Population, about 76,000.

Trebizond, *treb' ih zond*, also on the Black Sea, is an ancient town, commercially important since early Greek times, because the chief trade route from Persia to Europe descends to the sea at this point. Population, about 61,000.

The Land and Rivers. The western part of Turkey in Asia is the ancient Asia Minor through whose mountain passes, for many centuries, caravans laden with Oriental riches reached the island-fringed coast. The modern name for the section is *Anatolia*, derived from Greek words which mean *to rise*, and having reference to the table-lands which rise to an average elevation of 3,000 feet. These reach nearly to the sea, where they suddenly drop and form a narrow, fertile belt known as the *Levant*.

The table-land is not well adapted to agriculture, save where redeemed by irrigation, which is practiced in few sections. Ancient

peoples had irrigation systems much more extensive than any which exist to-day in the region. The surface of the plateau is largely treeless, with numerous salty lakes and marshes, and evidences here and there of former volcanic activity. It is essentially a grazing country, with high and low ranges of temperature. In the east there are mountain peaks 12,000 feet high, while on the south the Taurus Mountains rise about 7,000 feet, with several peaks reaching altitudes of over 10,000 feet. Valuable forests clothe the mountains which border this table-land. It is estimated that, of the 17,000,000 acres under forests, the state owns about eighty-eight per cent.

Several rivers cut across this plateau, or table-land, and empty into the Black Sea or the Aegean Sea.

Climate. Along the coast the climate is that of the Mediterranean countries, with hot summers, cool nights, and winters tempered by the sea; in the interior, the summers are hot and dry and the winters long and cold.

Agriculture. Although Turkey is chiefly an agricultural country, the methods in use have been very primitive. Of three former hindrances to agriculture—bandits, excessive tithes, or taxes, and lack of transportation—the first two have been removed, and transportation is being rapidly improved. The chief difficulty in the early years of the republic was lack of finances, a drawback felt throughout all departments. Turkey preferred to make progress slowly, without the help of foreign finances, but also without the burden of foreign interference.

Both railroads and government did much to assist the farmers. Railroads distributed seeds on deferred payment, and carried agricultural machinery at half the freight charge; while the government distributed machinery free, encouraged coöperative societies, and established an agricultural bank. Many agricultural schools were established in various parts of Turkey.

President Mustapha Kemal's farm near Ankara was designed as a model for the new era. Good farm buildings, tractors, thrashing machines, and all the modern Western implements and methods were employed. The farm was organized for fruit-growing (with a modern canning factory), vegetable- and crop-raising, and stock-raising. Other model farms, smaller than that of the President, were organized, and on them the work of training agricultural experts was started.

The principal agricultural products of Turkey are tobacco, cotton, figs, olives, fruits, and nuts. Mohair and wool are among the heaviest exports, while silk, cereals, canary seed, and timber products are other important items. The cultivation of a fine grade of tobacco in the Samsun area is increasing; six foreign tobacco-trading firms have established branches there. Sugar beets have been introduced, and have proved successful. Stock-raising is highly important, and Angora goats and sheep are a source of wealth to both agriculture and industry.

Fisheries. Turkey has a valuable source of income in the waters of the Black Sea and the Bosphorus, for anchovies, mullet, sturgeon, and tunny abound, and are fully exploited. Lobsters, mussels, and oysters are found in the Sea of Marmora. Unfortunately, the migrations of the non-Turkish population which followed the advent of the republic took many of the best fishermen from Turkey.

Mining. Mining has received little attention, but Anatolia holds riches for the future. Gold, coal, lead, copper, salt, and petroleum are found in abundance. The mines near Eski-Shehr are the chief source of meerschaum, valued in the manufacture of pipes. Oil in the Mosul area added to the difficulty of assigning that region, but a satisfactory arrangement was finally reached, whereby Turkey receives a revenue from oil obtained there, although it was obliged to relinquish the land to Iraq. A rich vein of coal has been discovered, running parallel to the Black Sea, from Ereğli to Queboli.

Industries. The deportation of the Greeks and Armenians in the exchange of population after the World War was a serious blow to Turkish industry, as these races had furnished the merchants and business men of the old empire. Vigorous measures were taken; several industries, such as the exploitation of salt

and the manufacture of tobacco products, matches, and cigarette paper, were nationalized, and the government supervised the manufacture and sale of alcohol and alcoholic beverages. Factories were given government assistance and relief from certain taxes, while

e u b m



mum bebe banya

bu - em - ye - ab
bey - bat - tut - ebe
mat - mey - tam - yem
baba - yama - boya
maya - umum
bayat - yam yam
tamam
banya ye - ata yem
mama ye, meme em, yat

Photo - O R O C

CHANGING THE ALPHABET IN TURKEY

Mustapha Kemal, organizer of the new Turkey, is attempting to raise the people from their unlettered condition to one of comparative enlightenment. The old Turkish letters have been discarded, and the English alphabet has been adopted. Above is a lesson in the new form of letters, taken from a Constantinople daily paper. The newspapers are ably seconding the efforts of the government.

a bank similar to the agricultural bank was established, to give aid to new industries and commercial undertakings. Carpet-weaving is still one of the chief industries; the manufacture of rugs, cotton, and mohair goods, and the curing and exporting of tobacco, or its manufacture into cigarettes, furnish employment for many. In 1925 a cotton mill operating 8,000 spindles was established in the Adana district, and sugar factories have been established in a number of towns.

Transportation. When the World War began, in 1914, Turkey in Europe had 1,050 miles of railroad; Asiatic Turkey had 2,835 miles. Constantinople had direct communica-



Photo: Wide World

PAST AND PRESENT COSTUMES OF WOMEN

At left, costume worn by the women of Turkey in the middle of the fifteenth century. Second figure, a costume of the seventeenth century. Third, the dress of women at the time of the outbreak of the World War. The last two figures are displaying styles of dresses worn by the "new woman" in the cities since the beginning of Mustapha Kemal's modernizing crusade.

tion with Paris and Berlin, and had not the war put a stop to development, it would soon have had a rail route through Baghdad to the Indian Ocean.

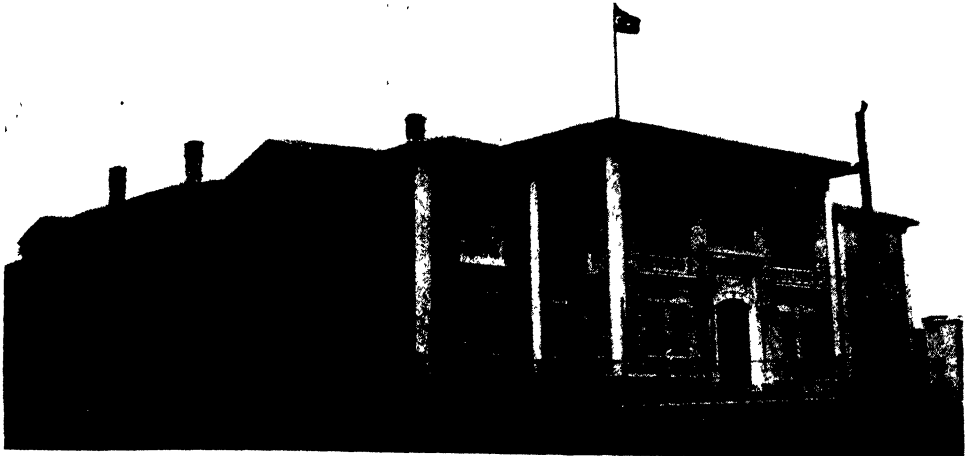
The total length of railway in 1928 was about 2,775 miles, and there is nearly as great a mileage under construction. Besides the railroad property and equipment which were destroyed by ravaging armies, Turkey lost over 1,500 miles of railway in readjustments after the World War, but new railways are being constructed as rapidly as funds are available. The Anatolian Railway, from Constantinople to Ankara and Konia, is one of the main roads. Among the newer railways are the Ankara-Sivas, Samsun-Sivas, and Ankara-Eregli lines. American engineers received a contract from the Turkish government in 1928 to build 750 miles of new railway. They were also authorized to construct two ports, building breakwaters, piers, and docks, at Mersine on the Mediterranean and Samsun on the Black Sea.

The Turkish Government

In the very early days, the Turks were a nomadic people, wandering with their herds across the Asiatic countries. Theirs was not an idle, vagrant existence, for a well-developed social organization held them together under

the firm rule of their chieftains. Because they were so well organized, the Turks formed a wonderful fighting machine, which swept over Asia into Europe and to the very doors of Vienna. When these people settled down in their conquered territory, their organization continued, and the chieftain became the despotic sultan of the old Turkish Empire, ruler of a heterogeneous people—Turks, Kurds, Armenians, Bulgarians, Jews, and Greeks. With no common element of race or religion to hold this vast empire together, force became the ruling power, and a great army of governors and petty officials exercised this power; with this system, the political rivalry, graft, corruption, and violence developed that made life miserable for all the people of the empire. Much was told, by missionaries seeking funds, of the terrible plight of the Christian Greeks and Armenians, but the Turk, too, suffered, under the excessive tithes and the abuse of the political system.

In 1908 the Young Turks revolted, and the sultan restored a Constitution that had been granted in 1876, but suspended two years later. Until 1922 Turkey was, therefore, a limited monarchy, although the appointment of Senators and officials by the sultan meant that his autocratic rule was but slightly impaired. Foreigners were not concerned in these



THE PARLIAMENT BUILDING.

Photo: O R O C

changes, for they had obtained special courts and special privileges known as "capitulations." The chief influence brought to bear upon the sultan's government was that of the European nations, which by political treaties alternately threatened or supported Turkey, as best suited their interests.

Since the decree of 1923 and the Constitution of 1924, Turkey has been officially the National State of Turkey, ruled by a National Assembly, and with a President instead of a sultan (see *History*, below). The Assembly exercises the legislative power directly; the executive power is entrusted to the President, who is elected by the Assembly to serve a term corresponding

to the term of the body which elects him; and to a Cabinet, chosen by the President. The Assembly enacts the laws, makes war, treaties, and concessions, and it also controls financial affairs.

The unwieldy vilayets have been abolished, and the name is now given to provinces or departments. Each vilayet has an elective council of its own; at its head is a *vali*, representing the government. The foreign "capitulations" have been abolished. The secularization of the Moslem courts, schools, and laws, and complete separation of Church and State, are drastic steps in the Westernization of Turkey, which is the aim of the Nationalists.

History of Turkey

European Empire Established. The Ottoman Turks were originally an Asiatic people, and their movement westward from their home in Iran began in the early thirteenth century, when they made their way to Asia Minor. Here Osman, or Othman, from whom their name is taken, built up an independent empire on the ruins of that of the Seljuk Turks. The sultans who followed Osman not only spread their rule over all of Asia Minor, but extended it into Europe as well, gaining possession of Serbia, Bulgaria, Greece, and Macedonia.

More than once the Turkish armies were led against the great stronghold of Constantinople in vain, but in 1453 Mohammed II, "the Conqueror," captured the city, and the Byzantine Empire was at an end. Constantinople was made the center of Turkish rule.

Centuries of Conflict. Mohammed II attempted wider conquests in Europe, aiming especially at Hungary. The empire continued to prosper for about a century, and under

Solyman the Magnificent (reigned 1520 to 1566), it reached the height of its power and splendor.

The sultans after the time of Solyman began to show that effeminacy and love of luxury which are so often the result of success, and the glory of the Ottoman state declined. In 1571 the fleets of Venice and Spain inflicted a severe defeat upon the Turkish fleet in the memorable Battle of Lepanto, and in the years that followed, Persia recaptured considerable territory in Asia. At Saint Gotthard the Turkish armies were defeated by the Austrians in 1664, but the treaty that followed was not disadvantageous to the Turks. Nineteen years later, Vienna was again besieged by the Turkish forces, but Poland's king relieved the city and saved Central Europe from coming under the sway of Mohammedanism.

Early in the eighteenth century, the Turks came into conflict with another enemy, with whom they were destined to be at war inter-

mittently for over two centuries. This new enemy was Russia, which, during the reign of Peter the Great, had become a power to be reckoned with. By 1774 Russia had gained such an advantage that Turkey was forced to give up the Crimea and other territory in the region of the Black Sea, open its waters to Russian vessels, and allow Russia a partial protectorate over Wallachia and Moldavia. Another war, which lasted from 1787 to 1791, ended in further territorial loss to the Turks.

The Nineteenth Century. Turkey did not escape being involved in the Napoleonic wars, but Egypt, which was captured by Napoleon in one of his early campaigns, was later restored by England. From 1806 to 1812, Turkey was at war with Russia, and at the close was obliged to give up all claim to the territory between the Dniester and the Pruth. In 1821 Greece declared itself independent, and after an heroic struggle made good its claim. The Peace of Adrianople, which closed the Russo-Turkish War of 1828-1829, loosened Turkey's hold on some of its other dependencies.

Between 1831 and 1839, there was intermittent warfare between Mehemet Ali, viceroy of Egypt, and his liege lord, the sultan, and only the intervention of other European powers prevented the complete overthrow of Turkey. As it was, Mehemet Ali was recognized as hereditary viceroy of Egypt, owing allegiance, however, to Turkey.

Meanwhile, the Eastern Question, as it was called, had become a decided factor in the politics of Europe. Russia was determined to take advantage of Turkey's gradual weakening to aggrandize itself, while the other great powers desired the preservation of Turkey, that Russia might not profit too much. Thus, in the Crimean War, Turkey had England and France as allies against Russia (see CRIMEA). The problem was by no means settled, however, and when, in the years following 1875, the Montenegrins, Serbians, and Bulgarians rose in revolt against Turkey, Russia announced itself as their champion.

The Russo-Turkish War of 1877-1878 followed, in which the Turks were defeated and compelled to agree to terms which meant the practical disruption of the empire. Again the powers intervened, however, and in the Congress of Berlin forced Russia to surrender a large part of the advantage gained. In 1881 Thessaly and a part of Epirus were ceded to Greece; and in 1885 the revolution at Philippopolis compelled Turkey to consent to the annexation of Eastern Rumelia, its choicest province, to Bulgaria.

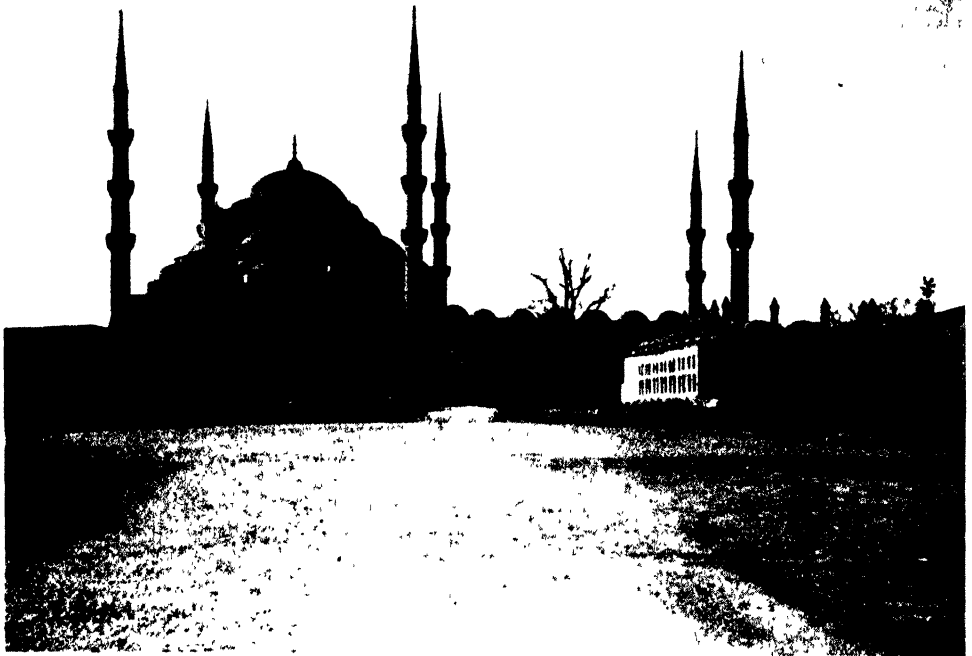
The Period of "Reforms." Meanwhile, within the empire revolts were almost constant. An especially serious one in Macedonia, in 1903, which the Turks attempted to put down by brutal massacres, led to the intervention

of the Western nations, whose governments demanded reforms. The sultan promised much, but performed little, and internal matters went from bad to worse. In 1908 a reform party, the Young Turks, fired with patriotic dreams of a recreated, modern Turkey, made a demand for constitutional government, and forced the sultan to accede to their demands. The first Parliament met in 1909. These disturbances gave the neighboring states the opportunity for which they had been waiting, for in 1908 Austria-Hungary announced the annexation of Bosnia and Herzegovina, and Bulgaria, the same year, proclaimed its complete independence and became a kingdom.

The Young Turks found difficulty in establishing their reform principles in Constantinople, and in 1909 they were forced to put down a serious revolt. Since this revolt had had the support of the sultan, Abdul-Hamid, they deposed him and made his brother, Mohammed V, sultan in his stead.

A Time of Wars. In 1911 war broke out with Italy, and in October, 1912, when the struggle closed, Turkey gave up its hold on Tripoli and Cyrenaica (now Italian Libia). Then, before the exhausted country had recovered from this brief but sharp conflict, the allied Balkan states declared war on Turkey (see BALKAN WARS). At the end of this war, Turkey was compelled to give up all its European territory but Constantinople, Adrianople, and a little of the surrounding region.

The World War and Its Results. Turkey joined the Central Powers in November, 1914, for Germany had a secure economic and military hold on the Ottoman Empire. Though the Turks successfully resisted an allied attempt to force the passage of the Dardanelles and capture Constantinople (February-December, 1915), they saw the gradual disintegration of the empire as the war progressed. In January, 1915, Egypt passed under British control. In 1916 the Arabian province of Hejaz, having an area of about 96,500 square miles, revolted, and an independent kingdom was proclaimed. The Arabians proved a valuable aid to the Allies in the warfare against the Turks. Jerusalem and the rest of Palestine, Syria, and Mesopotamia were conquered by the British before the Turkish government asked for an armistice, in October, 1918. The humiliating terms of the armistice which the Turks accepted, hoping to alleviate their sufferings, were made more bitter when the Allies, with their fleets and armies, occupied even more territory than the agreement allowed. The Straits and Constantinople were in the hands of the Allies, and the Greeks occupied Smyrna, in order to block Italy's designs upon Anatolia. Atrocities which followed the Greek occupation fired all Turkey with national feeling.



Photos: Keystone

In Constantinople. Above, the Sultan Achmed Mosque, the largest structure of the kind in a city of mosques. Below, in the background, the new University of Law and Letters, a modern structure. The entrance gate is at the roadside.

Under the leadership of Mustapha Kemal, a National Congress met at Erzerum in 1919. In 1920 the Parliament at Constantinople signed the National Pact, in which Turkey first declared its rights to Anatolia, Eastern Thrace, and Mosul; asked that the foreign privileges be abolished; and agreed to the internationalization of the Straits. In 1920 the Allies forcibly occupied Constantinople, and, although they had agreed to recognize the Nationalist Parliament if it met in Constantinople, the British forces arrested its representatives. Those who escaped fled to Ankara, where the Parliament was reconvened and



Photo: O R O C

THE AMERICAN EMBASSY AT ANGORA (ANKARA)

Mustapha Kemal was elected President. From 1920 to 1922, Asia Minor was under the government of the Assembly, while the sultan's government was effective only in Constantinople and the area around it.

The Treaty of Sèvres, which was signed by the sultan's emissaries in 1920, gave most of Eastern Thrace and Smyrna and the surrounding area provisionally to Greece, and mapped out spheres of French and Italian influence in Anatolia. All Turkey raged when this treaty was signed; even in Constantinople the shops were closed and prayers were said for the country. In Anatolia the Nationalists took on new courage. Early in 1921, Turkey and Russia signed a treaty of friendship, and Russia was the first to recognize the Nationalist government in Ankara. A change of government in Greece, by which King Constantine was returned to power, and the continued defeats of the Greek troops, caused the sympathies of the Allies with Greece to wane. It became quite evident that the Treaty of Sèvres would have to be recast, and unsuccessful attempts were made in the direction of agreements with Italy and France. New Greek offensives, begun in July, 1921, were defeated by Mustapha Kemal and his forces, and he was awarded the title *Ghazi* (Conqueror) by the National Assembly. In October, 1921, France made a separate treaty with the Nationalists, withdrew from Cilicia, and retroceded to Turkey a strip of territory along the Syrian

border. The Greek forces were defeated in 1922 in a Turkish offensive (see SMYRNA), an armistice with the Allies was signed, and the peace conference at Lausanne was opened.

Formation of the Republic. In November, 1922, the National Assembly abolished the sultanate, and the caliphate, or spiritual authority, was offered to Abdul Mejid Effendi, cousin of the deposed sultan. A year later, the caliphate, so long the symbol of Turkey's spiritual leadership of the Moslem world, was cast aside, and Turkey began a thorough course of secularization of schools, courts, laws, and customs. Turkey was declared a republic, Mustapha Kemal was elected President by the Assembly, and Ankara took the place of Constantinople as the official capital.

Turkey's relations with the European powers were settled at Lausanne (see LAUSANNE, TREATY OF), Turkey winning its demands on all points save the Mosul question. That was not settled until December, 1925, when the Council of the League of Nations decided that the Mosul area should remain a part of Iraq and under British mandate; Turkey, however, was to derive a ten per cent profit from the oil wells of Iraq during the twenty-five years of the British mandate. Another important provision had to do with exchange of population. It was very evident to Turkey that a condition of many races under one government was not conducive to the peace and prosperity of a country—especially a new one. To avoid this, and to achieve the nearest approach to national unity, the Orthodox Greeks in the new Turkey were exchanged for Moslem Turks in Greece. All Christians, including Greeks, were allowed to remain in Constantinople and enjoy the same rights and privileges accorded other minorities in Europe. The exchange of people, of course, had its unfortunate aspect, for many were compelled to leave homes occupied by their forefathers for many generations, and to seek new ones in a strange land. Although by the treaty Turkey lost much territory, what remains is entirely Turkish; there is no "lost Turkey" to regain by subsequent wars, and the Turks are left to work out their own destiny.

The New Turkey. One of the most complete transformations recorded in history has been wrought in Turkey since the close of the World War. An abrupt severance from everything that symbolized the past has been made, and the keynote of all the changes is Westernization. The fez, the veils for women, turbans, polygamy, and harems—all reminiscent of a decayed civilization—have gone; and in their place have come European headwear and new marriage and inheritance laws. No longer may a man divorce his wife by dropping three pebbles and repeating a few words. Another fundamental change was the secularization of

OUTLINE AND QUESTIONS ON TURKEY

Outline

I. Location and Size

- (1) Largest part in Asia
- (2) Small portions in Europe
 - (a) Part of greatest importance
- (3) Total area

II. The Land and Its Resources

- (1) Physical features
- (2) Climate
- (3) Agriculture and Mining
 - (a) Products
- (4) Industries
 - (a) Exports

III. The People

- (1) Races
- (2) Former condition of people
- (3) Change in nationalities
- (4) Social life
- (5) Religion
- (6) Education
- (7) The cities

IV. Transportation

- (1) Railways

V. Government

- (1) Former government
 - (a) In theory—a limited monarchy
 - (b) In practice—intolerant autocracy
- (2) Government under the republic
 - (a) Assembly
 - (b) President and Cabinet

VI. History

- (1) Empire in Europe founded
 - (a) Fall of Constantinople
 - (b) Later conquests
- (2) Conflict with Russia
 - (a) Crimea surrendered
 - (b) Eastern question
 - (c) Crimean War
 - (d) Russo-Turkish Wars
- (3) Internal struggles
- (4) Balkan Wars
 - (a) Great loss of territory
- (5) World War
- (6) Reorganization

Questions

Who founded the former capital of Turkey? What part has it played in history? Where is the Levant? What does the name mean? For what is it famous? (See LEVANT.)

What changes in territory occurred between 1914 and 1919? What is the present extent of Turkey?

Why were the powers so desirous of a partition of Turkey?

Why should an American desiring to learn the Turkish language now find his task comparatively easy?

Explain the meaning of *Sublime Porte*.

What important changes in dress have recently been made in Turkey?

Describe the educational system of the republic, and state several ways in which it differs from the old.

Why may Turkey no longer be called "the Sick Man of Europe"?

Explain why non-Turkish nationalities were sent out of Turkey and exchanged for Turks living in other countries.

How has Ankara solved the traffic problem? Describe other changes made to modernize the city.

Name the principal agricultural products of Turkey. What important new product has been introduced?

Describe the activities of the Young Turks.

What Turkish leader was mainly responsible for the Westernization of his country? What position did he hold in the new republic?

How has the social and political status of women in Turkey been affected by recent events?

laws and schools. Formerly, the Koran was the book of law as well as religion, and many unfair advantages and privileges were granted to "believers."

In 1928 a law was passed which ordered the abandonment of the Arabic alphabet, and promulgated a new Turkish alphabet, based on the Latin characters of the Western languages. Up to that date, the Arabic alphabet had been used. It was originally adopted when the Mohammedan religion was accepted, for the purpose of linking together the Mohammedan civilizations. For a similar reason, the Latin alphabet has been adopted, for, more than anything else, Turkey now is eager to become Westernized. The Western alphabet will not only make the Turkish language easier

and free literature have been provided, to teach all who desire to learn.

The twenty-four-hour day, beginning at midnight, and the Gregorian calendar were adopted. Except for a religious uprising of the



for the Turk to master, but also make it easier for the American, Frenchman, or Englishman to learn. The new alphabet has only twenty-seven letters, as compared with the hundred and twenty-seven of the old. Turkish sounds, moreover, are much more readily expressed through the vowels of the Latin letters.

So revolutionary a change cost the government more than \$3,000,000 during the first few months of enforcement. School books had to be translated into the new characters, newspaper equipment had to be changed, with resulting loss of circulation, all public signs were remade, and all periodicals set with the new symbols. Free public lectures, night classes,



How bless'd, how envied, were our life,
Could we but 'scape the poulterer's knife!
But man, curs'd man, on Turkeys preys,
And Christmas shortens all our days:
Sometimes with oysters we combine,
Sometimes assist the savory chine;
From the low peasant to the lord,
The Turkey smokes on every board.

—GAY: *Fables*.

Kurds of Turkish Kurdistan, which was suppressed by the Nationalists in 1925, Turkey has enjoyed the peace necessary to the new progressive measures. A friendly treaty between Soviet Russia and Turkey was signed in 1925, and an ambassador was sent to China in 1927. The first ambassador from the United States to the new republic went to Turkey late in 1927. The rapid strides in the development of Turkey along all lines—in government, politics, army, education, public works, housing, sanitation, railroads and communications, agricultural methods, and economic and social conditions—have revealed an earnest desire for constructive progress. Great credit is due Mustapha Kemal, for it was he who made it possible.

J.H.M'K.

Related Subjects. The reader who is interested in Turkey will find much that is helpful in the following articles in these volumes:

GEOGRAPHICAL TOPICS

Anatolia	Levant
Asia Minor	Marmora, Sea of
Bosporus	Smyrna
Constantinople	Taurus

HISTORY

Abdul-Hamid II	Lausanne, Treaty of
Balkan Wars	Mohammed V
Berlin, Congress of	Mohammedanism
Byzantine Empire	Russo-Turkish Wars
Caliph and Caliphate	Seljuks
Crimea (Crimean War)	Sèvres, Treaty of
Dardanelles	Solyman II
Gallipoli	Thrace
Hejaz	Troy
Iraq	Turks
Kemal, Mustapha	World War

LEADING PRODUCTS

Carpets and Rugs	Fig
Cotton	Meerschaum
Date and the Date	Mohair
Palm	Tobacco

TURKEY, one of a group of game birds related to the pheasants and native to North America. There are but two species—the Yucatan and Central American turkey, a small, brilliantly colored bird with eyelike spots on the tail coverts; and the wild turkeys of Mexico and the United States, represented by five subspecies. The wild turkey of Southern Mexico is the breed from which the domesticated turkey of the poultry yard is derived—the turkey that finds a place on the dinner table at Thanksgiving time and at Christmas festivities.

The common wild turkey was once abundant as far north as Maine and Southern Ontario, and was the noblest game bird in America. Unfortunately, it is rapidly approaching extinction. The adult male is about four feet long, and is clothed in handsome plumage with metallic-green, copper, and bronze reflections. The body feathers are tipped with black, and the tail and upper tail coverts with chestnut. There are fourteen to eighteen feathers in the tail. A long tuft of bristle-like feathers hangs from the center of the breast, the legs are spurred, and wattles are found on the head and neck, which are bare of feathers. The female is smaller and has duller plumage, and she lacks the tuft of bristles.

In their native haunts in the forests, these turkeys congregate in small flocks, coming into the open only to secure food. They are fond of nuts, seeds, insects, berries, and other small fruits. At night they roost in the trees. The crude nests, lined with dry leaves, are placed on the ground.

Turkey eggs are about twice as large as those of the common fowl, and are pale cream-buff, speckled with brown.

The breeding of turkeys is an important item in the American poultry business, though the number of turkeys raised is much less than the number of chickens, because the eggs of the latter are more valuable and there is greater demand for the smaller fowl. Turkey flesh is nutritious, of delicious flavor, and easily digested, but is too expensive to be as common an item in the diet as chicken. The largest and most popular of the domestic varieties is the *bronze turkey*, which shows its descent from the wild turkey of Southern Mexico by the copperish-bronze sheen in some parts of the plumage. The cocks may reach a weight of thirty-six to forty pounds.

Turkeys require much the same care as chickens (see **POULTRY**), but are more dependent on having a wide range, and are more delicate, especially when young. The hen usually produces a brood of about twelve, and but one brood a year, unless she loses the first hatching. Because the cock is disposed to break her eggs, a turkey hen is very ingenious about finding hiding places for her nest. Turkey-raising is also carried on in Europe, the first birds having been carried over from America in the sixteenth century. The turkey is the only bird which America has contributed to the group of domesticated fowls. D.L.

Scientific Names. American turkeys are placed by some naturalists in the family *Meleagridae*. Others regard them as a subfamily in the pheasant group, *Phasianidae*. The Yucatan turkey is *Meleagris ocellata*; the wild turkey is *M. gallopavo*. The Southern Mexican form is *M. mexicana*.

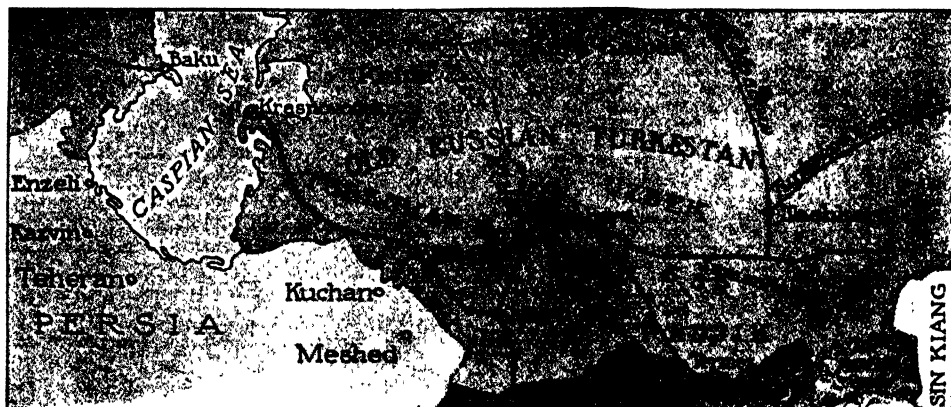


Photo Visual Education Service

THE TURKEY BUZZARD

TURKEY BUZZARD, OR TURKEY VULTURE, the most common of American vultures (see **VULTURE**). It has glossy, black plumage edged with grayish-brown, and a bright red head and neck. It is about thirty inches long, with a wing breadth of six feet, and can be distinguished at

a distance by the upturned ends of its wings. In common with other vultures, the turkey buzzard has the disgusting habit of gorging itself on the decomposing flesh of dead animals, and, when disturbed, of ejecting the mass before it attempts to fly. It is considered of



TURKOMAN AND NEIGHBORING SOVIETS

value as a scavenger. It nests in hollow stumps or logs, or on the ground under palmettos or bushes. The two handsome eggs are of a creamy color, mottled with reddish-brown or chocolate. These vultures range from Canada to Mexico. They may often be seen soaring high in the air, without moving a wing. D.L.

Scientific Name. The turkey buzzard belongs to the family *Cathartidae*. Its scientific name is *Cathartes aura*.

TURKEY RED, a dye. See Madder.

TURKEY RIVER. See IOWA (Its Waters).

TURKEY-TROT. See DANCING (Sensational Dances).

TURKEY VULTURE. See TURKEY BUZZARD.

TURKISH BATH. See BATHS AND BATHING, subhead.

TURKISH DRUM. See DRUM (Bass Drum).

TURKMENISTAN. See TURKOMAN SOCIALIST SOVIET REPUBLIC.

TURKOMAN SOCIALIST SOVIET REPUBLIC, also known as TURKMENISTAN, is one of the constituent republics of Soviet Central Asia, extending from the Caspian Sea to the Oxus River, and bounded on the north by Kara-Kalpak and Kazak. It is made up of the former Trans-Caspian region, part of Bokhara, and part of Khiva. These divisions were united in 1924, when Russian Turkestan was partitioned along ethnic lines; in 1925 Turkestan entered the Union of Socialist Soviet Republics, and includes the Turkoman and Uzbek republics (see RUSSIA; TURKESTAN).

The country is peopled by nomadic, warlike tribes who have roamed the deserts and plains for many centuries. The population has been estimated as high as 1,030,000, but other estimates are much smaller. The people are principally Turkomans, Uzbeks, Russians, and Persians. The country, 189,603 square miles in extent, is mainly desert plains, with a moun-

tainous region to the south. The climate is very dry, and cultivation is practically impossible without irrigation. Despite the nomadic nature of the people, agriculture is their main occupation, and wheat, rice, cotton, and fruit are produced, large sums having been spent on irrigation and the improvement of the land. Unreliable water supply and locusts sometimes play havoc with many of the crops. Watermelons and other fruits are raised, and silkworm breeding is important. In 1928 a large silk factory was built. Sheep and cattle are raised, and the Astrakhan fur from the sheep of this region is in great demand. It is also the home of a special breed of horses. The mineral resources include ozocerite, a waxlike mineral used in making candles; oil, sulphates, common salt, and sulphur.

Manufacturing has slowly increased as the country has overcome the chaos which followed the World War. Cotton- and wool-cleaning, brewing and distilling, glass manufacture, carpet-making, and fruit-drying are the chief industries. The Turkoman carpets, made in the homes of the natives, are famous. There are about 955 miles of railway, and a motor road, recently completed, provides communication across the mountain barrier which separates the republic and Persia. Airplane lines have been established, affording a striking contrast with the primitive mode of life prevalent in this country.

Ashkabad, or Ashkabad, the capital, is a frontier town on the Akkai oasis. It is attractively laid out, and has wide streets and beautiful trees. The manufacturing plants include cotton mills, tanneries, and brick works. The Trans-Caspian Railroad provides transportation, and a recently constructed electric-power plant offers additional inducements to industries. Population, about 54,000.

Related Subjects. For additional information, the reader is referred in these volumes to the following articles:

Russia (Size and Location)	Turkestan Turks	Uzbek World War
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"THE FIGHTING TÉMÉRAIRE"

A reproduction of one of Turner's most famous paintings.

TURKO-TATARS, *tah' tahrz*. See RUSSIA (The People).

TURKS, in a broad sense, the name of the Mohammedan subjects of the former Ottoman Empire, now the National State of Turkey. The name is applied more specifically to the Osmanli, or western Turks, who were conquerors of Constantinople, and to the inhabitants of the region in Asia known as Turkey. There are various other peoples, however, who belong to the same group linguistically; that is, who speak Turkish (or Turkic) languages. These include the Russian Tatars (or Tartars), the Turkoman tribes living between the Caspian Sea and the Oxus River (in Central Asia), the Kirghiz, the Siberian Tatars, and other nomadic tribes of Asia. There are also Turks in the Crimea, in the Caucasus, and along the Volga.

Related Subjects. The reader is referred in these volumes to the following articles:

Kirghiz Seljuks Tartars Turkey

TURMERIC, *tur' mur ik*, a plant native to Southern Asia, the fleshy rhizomes (roots) of which are the source of a substance, also called turmeric, which is used mainly for dyeing. The plant belongs to the ginger family, and is known botanically as *Curcuma longa*. Its rhizomes are hard and tough; externally, they

are brownish or yellowish-green, but when broken show a resinous interior which varies from orange-brown to deep reddish-brown. The roots are prepared for the market by being cleaned, boiled for some hours, and then dried in an oven. The yellowish powder which they yield when ground has a strong, aromatic odor and a strong, pungent taste.

Turmeric has been used for centuries as a dyestuff and as a condiment, and it is an important ingredient of curry powder. It does not yield a fast color, however, as a dyestuff. It has gone out of use as a medicine, but in India it forms, when mixed with milk, a cooling lotion for the skin and eyes. Turmeric is useful in chemistry in making test papers for alkalies, for on the addition of alkali, white paper soaked in a tincture of turmeric turns to reddish-brown, and on drying, to violet. See DYEING AND DYESTUFFS. G.M.S.

TURNER, JOSEPH MALLORD WILLIAM (1775-1851), an English painter, considered by many competent critics to be the greatest artist of the English school of landscape painting. Public appreciation of his work has been decidedly affected by Ruskin's praise of it in *Modern Painters*, though Turner won high honors in his day. His father, a London barber, native of Devonshire, recognized the boy's talent, and encouraged it in every way possible.

He taught his son to read, permitted him to neglect regular schooling for art study, and had him enter the Royal Academy in 1789. The next year, when Turner was but fifteen years old, he exhibited his first picture, a view of Lambeth Palace.

During his period of development, which continued until about 1800, he made designs for magazine prints, mastered the technique of water-color painting, and became known as one of the promising landscape artists of the day. About 1802, the year of his election to membership in the Royal Academy, he began to paint in oils, and during the next fifty years exhibited nearly 200 pictures at that institution. When he died, he bequeathed his valuable collection of paintings, engravings, and sketches to the nation, and this collection may be seen to-day in Turner Gallery, occupying two rooms of the National Gallery in Trafalgar Square, London.

Turner was a devoted student of nature, and to obtain material for his pictures, he was accustomed to go away alone on sketching tours, through England, France, Switzerland, and Italy. He depicted natural scenes with the brush of an idealist, not a realist, and his work has a high poetic quality that Ruskin calls "the Turnerian mystery." He used light and color in such a way as to create an effect of indistinctness, and at the same time his coloring was striking, even brilliant. Unfortunately, he did not fully understand how to mix oil colors, and some of his finest works have greatly deteriorated. As a master of water color, however, he has never had an equal, and in etching and engraving, he ranks with the best.

Turner died in a lodging at Chelsea, where he had sought seclusion in ill health, being known to the children of the neighborhood as "Admiral Booth," from his sailor-like figure and the known name of his landlady. He was buried in Saint Paul's Cathedral, and left a large fortune for the support of impoverished artists.

Representative Works. There are numerous Turner collections in America, and one may see good examples of his work in the Metropolitan Museum and the New York Public Library. His *Grand Canal, Venice*, which is admired for its beautiful treatment of sky and water, and *The Castle of Indolence*, are in the Metropolitan collection. The Boston Museum possesses his *Slave Ship*, and the New York Public

Library his *Staffa, Fingal's Cave*. His most popular picture, *The Fighting Temeraire*, shown without color on page 7319, is in the Turner collection of the National Gallery. It was exhibited in the Royal Academy in 1839. Other famous works are *Shipwreck, Sun Rising in the Mist, Bay of Baae*, and *The Splügen*, which depicts the grandeur of Alpine scenery.



Photo: Brown Bros.

J. M. W. TURNER

TURNIP, a common biennial plant of the mustard family, cultivated in gardens and fields for its fleshy root, which is used as a table and stock food. There are numerous varieties of turnips, and their roots vary considerably in shape. Some are elongated, some are round, others are broadened out, and some are spindle-shaped. The flesh is whitish or yellowish. Garden varieties are usually smaller and of more delicate flavor than field varieties. If the roots are desired for early summer use, the seed must be sown in the spring as soon as the ground can be worked, but planting for winter turnips need not take place until the middle of July, or even later. In the cultivation of garden turnips, the seeds are sown in shallow drills fifteen inches or more apart, and the plants are thinned until they are from four to six inches apart in the row. In field culture, the seed may be sown broadcast, or in drills two or two and a half feet apart. Careful hoeing is essential.

The roots will have a sweeter flavor if not dug until they have had a touch of frost, but severe freezing will spoil them. They may be stored for winter use in damp earth, sand, or leaves, but a cellar with earth walls and floor makes a good storage house. If piled in heaps on the floor and covered with earth, they will keep indefinitely. The tops in all cases must be removed. Turnips are about nine-tenths water and have a low percentage of nutriment, but they can be cooked and served in an appetizing way, and they give variety to a meal. Large quantities of field turnips are fed to stock in Great Britain, Europe, and Canada, and to some extent in the United States. The tender growing tops are sometimes used in spring as a green vegetable.

A species known as the *Swedish turnip*, or *rutabaga*, has a large root of firm flesh, pro-



TURNIPS

Fleshy roots and tops.

nounced flavor, and yellow color. The rutabaga is used as a stock food more extensively than the ordinary turnip; sheep especially prefer it.

B.M.D.

Scientific Names. Turnips belong to the family *Cruciferae*. The common turnip is *Brassica rapa*; the rutabaga is *B. campestris*.

TURNSTONE, the name applied to two small species of shore birds, with reference to their habit of turning over shells and pebbles

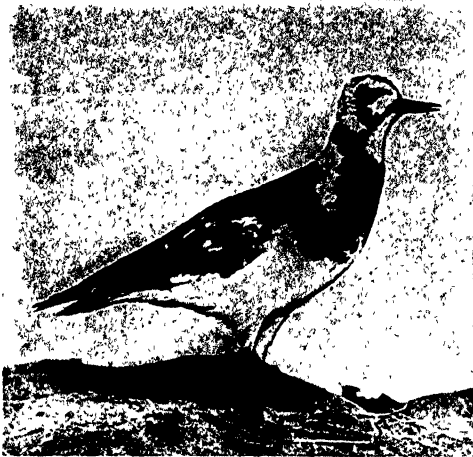


Photo: Visual Education Service

THE TURNSTONE

with their bills, in search of food. The common turnstone nests only in Arctic regions and migrates in winter to far southern shores, reaching the coasts of the Eastern United States in its migrations. It is a bird about nine inches long, with variegated plumage of black, white, and reddish-brown. The turnstone of the North Pacific coasts is similar, but lacks the reddish color in the plumage. These birds lay four olive-green eggs in secluded nests near shore.

D.L.

Scientific Names. The turnstones are related to the plovers and belong to the family *Aphrizidae*. The common turnstone is *Arenaria interpres*; the Pacific species, *A. melanocephala*.

TURNVEREIN, *toorn' fehr ine*, a name given to the athletic organizations established in Germany, about the beginning of the nineteenth century, by Friedrich Ludwig Jahn, and later to similar organizations in America. The organizations proved popular after the Napoleonic wars, and their membership rapidly increased. They had an enormous influence in building up a vigorous and hardy generation. The first societies in the United States were formed in Philadelphia and Cincinnati in 1848 by German refugees, and such societies are now to be found in America in most large centers of German population. The membership in America is about 40,000.

Friedrich Ludwig Jahn, *yahn* (1778-1852), was known as "Father Jahn" among his school children. These he gathered about him on holidays in Berlin, to play games, until their numbers grew so large that he built an outdoor gymnasium, of which the modern turnverein is the outgrowth. In 1809 he began teaching in Berlin; there he tried to develop harmony and kindle a public spirit among his pupils in their games. His efforts resulted in the establishment of gymnasia, not only in Berlin, but in many other cities of Germany. In 1819, as a result of his agitation in favor of German national independence, Jahn was arrested, and later forced to live in seclusion for over twenty years. When Frederick William IV of Prussia ascended the throne, he decorated Jahn with the Iron Cross and gave him his liberty, but he died in comparative poverty and obscurity in Freyburg, where a turnhalle, or school of gymnastics, has been erected over his grave. See PHYSICAL EDUCATION (Development Through the Centuries).

TURPENTINE. The fluid we buy in the paint store as turpentine is, correctly speaking, oil, or spirits, of turpentine, a substance obtained by distilling the real turpentine. Turpentine is the resinous sap of various species of pine. It is a thick, gummy substance, obtained from the trees in much the same way that maple sap is secured from maple trees. The bark is cut away with a special tool, and the sap is collected in metal cups. It is then boiled in a copper vat, the heat causing the turpentine to change into vapor; the vapor passes into a coil of pipe cooled by water, and is there condensed into oil, or spirits, of turpentine. The part left in the vat forms the resin of commerce (see ROSIN). Since the spirits of turpentine will ooze through ordinary wooden barrels, special containers are used for the product, the insides being coated with glue. When this hardens, it holds the oil perfectly.

Oil of turpentine is a yellowish, highly inflammable substance, of strong, peculiar odor and hot, biting taste. It is extensively used as a drying medium in paints and varnishes, for it solidifies when exposed to air. It will dissolve paint stains on clothing. This oil is also coming into general use as a solvent for rubber and other gums in the manufacture of artificial camphor, from which plastics such as celluloid are made.

Medicinally, oil of turpentine is used externally and internally. As purchased for such purposes, it is a purified substance called *rectified spirits of turpentine*. In the form of a liniment, it is used for sprains or strains, while the oil itself is applied externally in pleurisy and bronchitis. Mixed with injections in the intestines, it materially assists in the expelling of wind or gas. It is an efficient worm-expelling remedy, and is used also for ulceration of the stomach and intestines. In typhoid fever, it acts favorably, assisting to heal the ulcerations of the bowel, which are characteristic of this fever, and aiding also in the expulsion of gas. In certain forms of urinary difficulties depending

on relaxed kidneys, it exerts a stimulating, contracting influence which is helpful in relieving the difficulty. Like all other medicinal agents, spirits of turpentine should not be taken except on a physician's prescription.

The chief sources of turpentine in the United States are the long-leaf yellow pine (*Pinus palustris*) and the slash pine (*Pinus heterophylla*) of the Southern states. A small quantity of wood turpentine is obtained by distilling pinewood. *Spruce turpentine*, a by-product in the manufacture of paper, has been made to produce dyes by means of chemical processes worked out at the University of North Carolina. See PINE. G.M.S.

TURQUINO, *toor ke' no*, a peak in Cuba. See CUBA (Physical Features).

TURQUOISE, *tur' kwoiz*, or *tur' kwoiz*, a beautiful, semi-precious stone of delicate green or blue shades. The color most prized is the robin's-egg blue. In chemical composition, the turquoise is commonly regarded as a hydrous phosphate of aluminum, and the color is due to the presence of copper or perhaps iron phosphate. Chemists do not altogether agree on these points. When the stone is heated, moisture escapes and the color becomes lighter. From this phenomenon arose the superstition that the fading of the color was a sign of misfortune. The turquoise is the national stone of Persia, and it is much admired by Orientals, who believe that it possesses healing power.

The stone is found in igneous and volcanic rocks in Mexico, in New Mexico, Colorado, Arizona, Nevada, and California, and in Persia, Asia Minor, Turkestan, and Siberia. The mines in Persia have been worked for at least 800 years, and produce the finest kinds. Fossil bone, colored blue by phosphate of iron, which is called *odontolite*, or *bone turquoise*, looks very

much like turquoise, but the two can be easily distinguished when seen under a microscope. The turquoise is the birthstone for December. See BIRTHSTONES; GEMS; and next page. T.B.J.

TURRET, a term derived from an old French word meaning *little tower*, applied in architecture to a small circular or equiangular structure at the corner of a larger building, and in ancient

days to a tall, movable structure, usually on wheels, bearing soldiers and military devices for scaling or battering the walls of a besieged castle or town. (See CASTLE.) In modern naval and military usage, a turret is a heavily armored, towerlike structure, usually revolving by machinery, for mounting and protecting guns, fired from the inside. In modern naval vessels, turret mountings are built into the ship to receive heavy guns—those of over six-inch caliber (over eight-inch in the United States navy). These heavy guns form the primary batteries of modern battleships and battle cruisers. Both turrets and guns are worked by power, either hydraulic or electric.

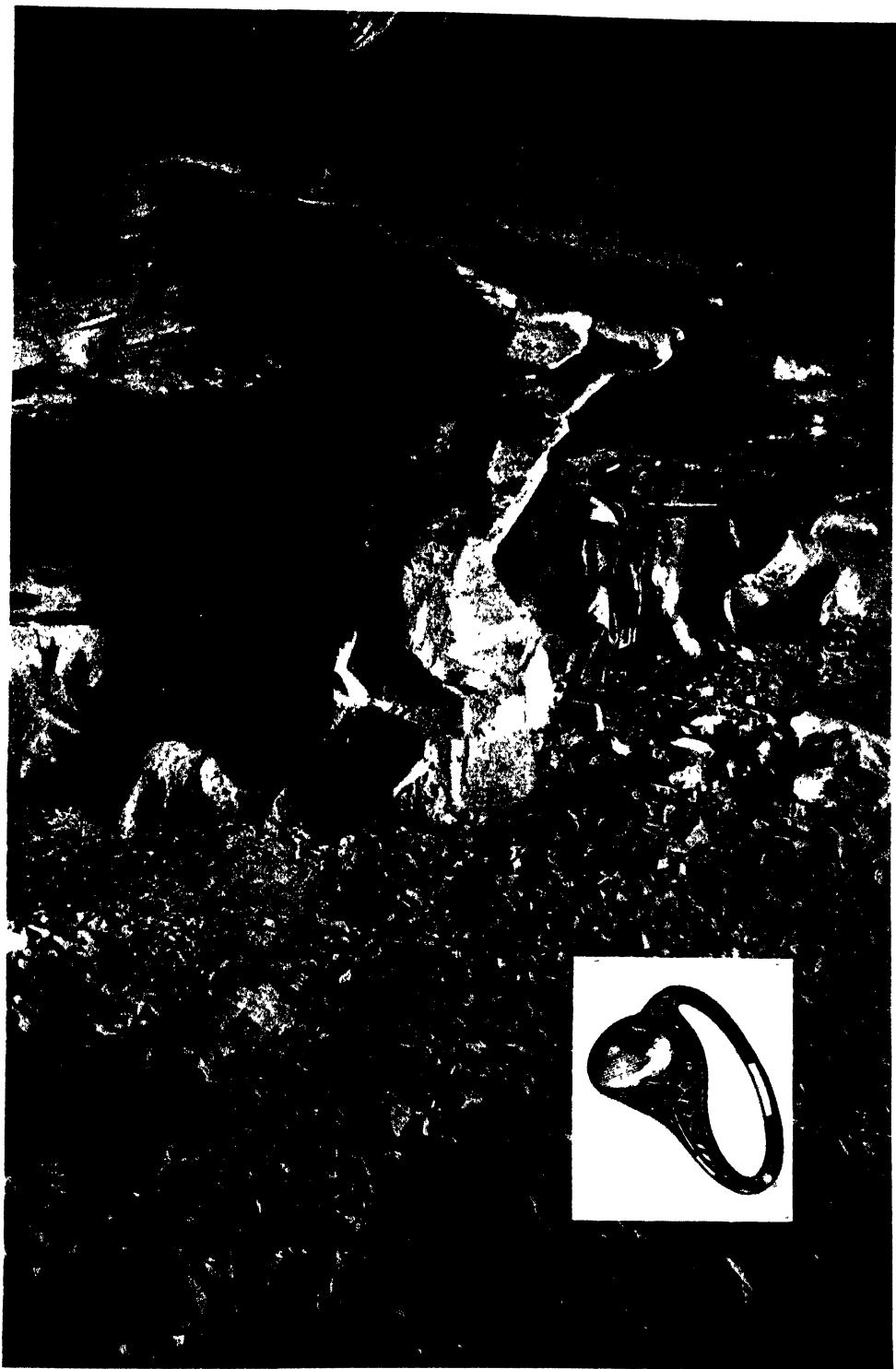
The *Monitor*, built by John Ericsson in 1862, was the first warship equipped with a practical turret, and turreted ships were long called *monitors*, after that famous vessel. [See WAR OF SECESSION (Monitor and Merrimac).] Naval turrets are sometimes double, one superimposed on the other, and even triple, each revolving independently; a triple turret may weigh over 1,000 tons. In the design of naval turrets, it is necessary to provide for the recoil of heavy guns when fired. This is accomplished by means of spring buffers or by the compression of air during the recoil.

Turret Lathe, in mechanics, the term applied to a lathe having a capstan head, called a *monitor* or *turret*, used as a holder for various tools and pivoted so as to revolve and present any of the tools to the work. See LATHE.



Photo: Visual Education Service

TAPPING PINE TREES FOR TURPENTINE



How Turquoise Is Obtained. The illustration shows the method employed in the Orient to secure turquoise from the rocks in which it is embedded. Inset shows a cut and polished stone set in a ring.



The sun bath

TURTLE. Among the many and varied devices that animals have acquired for protection against their enemies, none is more odd than the shell of the turtle tribe. A turtle always has a roof over him, for he carries his house with him wherever he goes. Says one zoölogist:

Were there no turtles living, we should look upon the fossil forms as among the strangest of all vertebrate animals—animals which have developed the habit of concealing themselves inside of their ribs, for that is literally what the turtles do.

The short, broad body of the turtle is covered above by the *carapace* and below by the *plastron*, which are joined in such a way that the head, limbs, and tail project through openings. The carapace consists of a series of bony skin plates, attached to and covering the backbone and dorsal ribs. The lower part is built



SOFT-SHELL TURTLE

around the breastbone and ventral ribs. In most species, horny shields or plates of varying pattern and arrangement cover the bony shell and help to identify the different families. One of the sea turtles, the leatherback, has a leathery coat all in one piece, instead of a hard shell in two sections. Still another variety is the soft-shelled turtle, representing a family of twenty-seven species. They have the characteristic carapace and plastron, but the horny

plates are lacking and the shell is soft and leathery.

The turtles constitute an order of legged reptiles of over 200 species. Some live wholly in water, some only on land, and others are fitted to live in either environment. Like other reptile groups, the turtles are found most abundantly in the tropics; the fresh-water forms are the most numerous. Scientists call the order *Chelonia*, but the names *turtle*, *tortoise*, and *terrapin* are commonly used to designate these reptiles. By some writers tortoise is reserved for strictly terrestrial species. Others use turtle and tortoise interchangeably for fresh-water species. Terrapin is applied rather loosely to various fresh-water turtles; it is used more especially for some of the edible species. Altogether, the chelonians form one of the most ancient reptile orders, and one that is unique in that no species, living or fossil, possesses teeth. The horny-edged jaws, however, are quite capable of biting hard substances, and some turtles can inflict serious wounds.

The adaptations of the turtles are most interesting. The land-dwellers are slow and clumsy, and need special protection from their enemies. The bones of the shell are closely united, and the head, legs, and tail can be withdrawn inside the shell when danger threatens. The plastron of the box tortoise (see subhead, below) has a hinge arrangement that permits him to close his shell up tight, by lifting the plastron to the carapace. Land tortoises have short, club-shaped feet with blunt claws, suitable for a terrestrial life and a peaceable existence. They feed chiefly on berries and vegetation, and by nature are docile.

Fresh-water turtles are more active than their land cousins, and have their feet partially or completely webbed, according to the amount of time they spend in the water. Many of them cannot withdraw the head, legs, and tail within the shell, but their quicker movements make up for the lack of this adaptation. Sea

turtles have paddle-shaped limbs, resembling those of whales. In some water species, the bones of the shell are not closely united, and the carapace usually is less arched than that of the tortoises, which need room for lung expansion. The water turtles, with their flatter shells, cannot breathe by expanding the ribs, but fill their lungs with air drawn in through the mouth. A supply of oxygen thus inhaled permits a turtle to stay under water for an hour or more, before coming up for air.

The chelonians all hatch from eggs, which are laid in holes scooped out by the female with her hind legs. These holes may be dug in a sandy beach, in soft ground, or even in the wood of a rotting log. The eggs are well covered, and left to hatch in the warmth of the sun. No care is given the young turtles by their mothers. Turtles are remarkable among the reptiles because of their ability to survive serious wounds and mutilations. The land tortoises, especially, live to great age. Specimens alive to-day show marks that indicate that they have lived for over 200 years. Turtles are prone to stay in the same locality for a lifetime, and the marine species go back each year to the same beach to breed. The eggs and flesh of some species are edible, and the horny covering of one of the sea turtles furnishes the prized "tortoise" shell of commerce. In temperate climates, turtles hibernate in mud through the winter. Some of the more interesting and important species are described in the paragraphs below

Snapping Turtles. These include a family of large fresh-water turtles whose powerful, keen-edged jaws well equip them to fight and to capture their food. Three species are found in North America, and one in New Guinea. The *common snapping turtle* is found east of the Rocky Mountains, from Southern Canada to Ecuador. It frequents sluggish, muddy streams and marsh ponds, in which it feeds

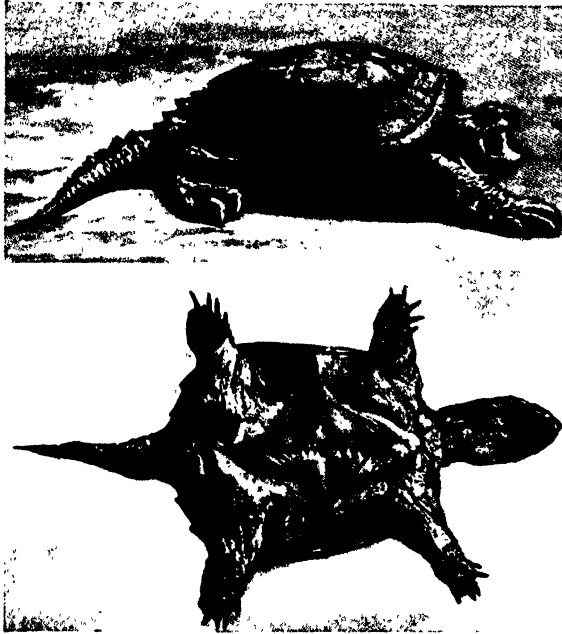
chiefly on fish, young waterfowl, and small aquatic animals. Sometimes the brown or olive carapace becomes wholly moss-covered, and the reptile then is easily mistaken for a stone in the mud. When attacked, it thrusts out a large, ugly head with the quickness of a snake, and its powerful jaws, which end in strong hooks, can inflict serious wounds. A good-sized specimen could easily snap off a man's hand. Old specimens are apt to grow

so fat that they are almost helpless on land, but these turtles usually do not leave the water, except to seize prey on the banks of pond or stream, or, in the case of the female, to lay eggs. The flesh of a fat snapper is a choice article of food. Snapping turtles reach an average length of twenty-eight inches, of which the carapace takes up twelve inches and the fleshy tail eleven. The average weight is about thirty-two pounds.

The *alligator snapping turtle*, found in the lower Mississippi River and in the streams flowing into the Gulf of Mexico, is

the largest of North American turtles. Big specimens may reach a weight of 140 pounds. In appearance and habit, the alligator turtle is a larger edition of the common species, but is correspondingly more powerful.

Mud Turtles. Also known as musk turtles, because of their habit of giving out a musky odor when irritated, the mud turtles form a group of small aquatic chelonians with mud-colored shells. They are found in sluggish streams or muddy rivers, in which they are often a nuisance to fishermen, because they are prone to seize their bait. Though rarely as long as five inches, when molested they snap and bite as viciously as the bigger snapping turtles. Some of the mud turtles possess hinged lobes on the lower shell that enable them to draw up the plastron against the carapace, in much the same manner as the box turtles do. The species are widely distributed in North America.



Photos Visual Education Service

THE SNAPPING TURTLE

The lower picture shows the structure of the underside of the body.

Terrapin. This is the only exact scientific meaning. It is applied to various pond, salt-marsh, and river turtles of aquatic and semi-aquatic habit. Both terrapin and mud turtle are names that interchangeably with musk and musk turtle.

In the United States, the name terrapin is more especially applied to the painted, yellow-bellied, and diamond-back terrapins and their allies. The painted terrapin, or pond turtle, is common in Eastern North America, especially in the Middle Atlantic states, and is easily recognized by its color markings.

The carapace is dark olive, brown, or black, and is bordered with crimson, while the plastron is yellow and the head black and yellow. Red occurs on the neck and legs. This turtle is about six inches long, and when full grown weighs about a pound and a half. It always feeds under water, but likes to bask in the sun on a log.

The yellow-bellied terrapin is distinguished by its deeply grooved carapace, which is about



TERRAPIN

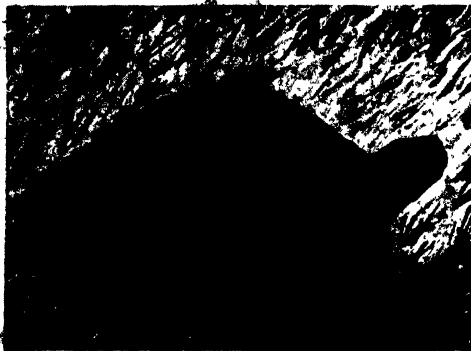


Photo: Visual Education Service

BOX TORTOISE

ten inches long. It is distributed from Virginia to Georgia, where it frequents stagnant pools and marshes. This species is sold in the markets, though its flesh is less esteemed than that of the diamond-back. The latter is so called from the peculiar formation of the shields on the olive-colored carapace. Average specimens have a shell between seven and eight inches long. Once common in the salt marshes of the Atlantic coast, the diamond-back has

become rare, but is sometimes propagated in enclosures, as its flesh is delicately flavored and in demand. It will not survive in water that does not contain salt.

Box Tortoise, or Box Turtle. These names

are applied to a group of turtles that can shut themselves securely inside their shells. The carapace and plastron are joined by a piece of elastic cartilage, and the plastron is divided in the center by a hinge. When menaced, a box turtle can draw the front and back sections of the plastron up against the top shell, and conceal himself inside a box that is ex-

tremely difficult to pry apart. Structurally, these chelonians are allied to the water turtles, but since they are land-dwellers and are like the true tortoises in habit, they are called by both names.

The common box turtle is found from the New England states as far west as Kansas. Its carapace is between five and six inches long, and black or dark brown in color, with variable yellow markings. This turtle is a voracious eater of berries and vegetation, not disdaining earthworms and slugs, and it sometimes grows to be so fat that it cannot keep the two parts of the shell clasped together.

Tortoises of the Land. Comparatively few strictly land turtles are found in the western hemisphere, and only three species occur in the United States. They are dull-colored creatures and frequent dry regions. The best-known species is the gopher tortoise, which seeks concealment in an underground burrow, dug in sandy soil. Gopher tortoises are common in sandy barrens in the Southern states. The shell of average specimens is nearly a foot long; the carapace is strongly convex.

Among the tortoises, the largest are the giant tortoises of the Galapagos and some other oceanic islands. Their shells sometimes grow to be over four feet long, and specimens may weigh as much as 500 pounds. Many of these odd survivals of the age of reptile monsters are found in zoological museums, but in their island homes they are rapidly nearing extinction.

Sea Turtles. The sea turtles are found chiefly in tropical and subtropical oceans, and grow to large size, averaging three to six feet



Photos: O R O C; Wide World

Where Turtles Grow Large. Above, natives of the Samoan Islands return from a turtle hunt. Below, a tortoise from the Galapagos Islands, three hundred years old, now in the New York Zoological Park. He is the largest member of the turtle family in the United States. The keeper has learned that he has a fondness for bananas.

in length. The *leatherback*, mentioned earlier in this article, is gradually decreasing in numbers. At home in the warm parts of the Atlantic and Pacific, and in the Indian Ocean, it sometimes wanders into the cooler regions, and is found occasionally on the American coast as far north as Cape Ann. The largest specimens grow to be six feet or more in length, and weigh from 800 to 1,200 pounds. The leatherback feeds on lobsters, crabs, shrimps, jellyfish, and other marine prey. Its own flesh is not eaten by man, as it has a disagreeable flavor and is reputed to cause sickness. Leatherbacks appear in large numbers on the Tortugas Islands off the coast of Florida during the breeding season. Sometimes more than 1,000 turtle eggs are found in one spot, where several females have deposited their eggs together. After they are hatched by the heat of the sun, the little turtles seek the water.

The *green turtle*, so called from the color of its fat, is notable in that it feeds on vegetable matter, whence its flesh is edible and well flavored. This is the turtle that is used for making the famous turtle soup of Lord Mayors' banquets and epicurean menus. It is distributed through all warm seas, and sometimes wanders as far north as Long Island. Very large specimens weigh as much as 500 pounds, but much smaller ones are usually seen in the markets.

The *hawksbill* is a small sea turtle from whose carapace our so-called *tortoise shell* (see below) is obtained. Another well-known sea turtle is the *loggerhead*, which has edible flesh of less desirable flavor than that of the green turtle. The eggs of these turtles are extensively used as food. L.H.

Tortoise Shell, a beautiful, partly transparent substance used in inlay work and in making combs, boxes, buttons, spectacle rims, and various ornamental objects. It is obtained from the horny plates covering the carapace of the hawksbill turtle.

The plates are so thin that it is necessary to weld a number together, and this is accomplished by heating them in oil or boiling them in water. By this process, they become soft, and can then be joined together through heat and pressure, and molded into desired forms. Genuine tortoise shell is very expensive, and is imitated in horn and celluloid. It takes a high polish, and is marketed in various shades of brown, variegated with patches of clear, amber yellow. L.H.

Classification. The order *Chelonia* is divided into two suborders, as follows: *Athecae*, the leatherback; and *Thecophora*, all other turtles. The snapping turtles compose the family *Chelydridae*; the musk turtles, *Cinosternidae*. The terrapins described in this article, the box turtles, and the land tortoises belong to *Testudinidae*. The leatherback belongs to the family *Sphargidae*; all other sea turtles to *Cheloniidae*.

TURTLEDOVE, one of several species of small doves found in the Old World. They usually nest in temperate regions and migrate

in winter to warm latitudes. In spring, their call is a plaintive cooing note. The turtledove of Europe is a bird of ashen plumage, tinged with wine-red. It inhabits woods and plantations, and feeds on seeds and grain. Being



THE TURTLEDOVE

shy, it is seldom seen. Its nest is loosely built and placed in a low tree or hedge. The eggs are creamy white in color and two in number. Two broods are reared in a season. The turtledove of the Scripture is supposed to be a species abundant in Asia Minor and eastward.

The similar North American species is known as the *mourning dove*. It is widely distributed from Canada to Mexico. See DOVE; PIGEON. D.L.

Scientific Name. Turtledoves belong to the family *Columbidae*. The European species is *Turtur com-*

TURTLE MOUNTAINS. See NORTH DAKOTA (The Land).

TUSCALOOSA, ALA. See ALABAMA (back of map).

TUSCANY, a territorial division, including nine provinces, on the west coast of Italy, distinguished as a center of art and learning, and notable for its history and associations. Tuscany lies along the Mediterranean Sea, north of the point of Rome. It is almost identical, geographically, with Etruria (which see), historically, with the ancient Etruscans, whose history dates from the eleventh century B.C.

The people of Tuscany have retained their distinctive linguistic characteristics, and their language, used by Dante and Petrarch, became the literary vehicle of standard Italian. Prosperous peasants are among the most numerous, and the industries flourish as in Europe, and the industries of cotton, wool, and silk manufactures, and much fur is produced; also straw hats, famous over as "Leghorns." The marble is quarried in Tuscany.

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